



supplementary data

S-3C

RTV-7 SILICONE RUBBER FOAM

General Electric RTV-7 Foam is a low density silicone sponge rubber which expands and vulcanizes at room temperature. Thorough mixing of the curing agent with the base compound initiates the chemical action. Within 10 minutes foaming and curing are complete and the cured foam may be handled. Like other silicone rubber materials, RTV Foam maintains its flexibility over a wide temperature range. It also has excellent electrical properties and good resistance to many chemical reagents.

Manufacturer's SpecificationsUncatalyzed Base Compound

Viscosity, Cps at 77 F	7000-9000
Color	Black
Specific Gravity	1.11 $\pm$.02
Shelf Life	3 Months

Cured RTV-7 Foam (5 Wt. % Stannous Octoate)
77F and 50 Percent RH

RTV Tack Free Time, Minutes	5 $\pm$ 2
Density, Max.	12.5 lb/ft ³

Some settling of the base compound normally occurs upon standing. To obtain uniform properties, thorough mixing should precede use.

Typical Properties of RTV-7 Foam

(These values are not for use in preparing product specifications)

CURED RTV FOAM

(100 parts of RTV-7 Foam mixed with five parts of catalyst. Samples cured 24 hours at 77 F and 50 percent RH.)

Density

Free Blown	= 12.5 lbs/ft ³
0.125 Inch Molded Slab	= 16.7 lbs/ft ³
*Tensile Strength	= 20 psi
*Elongation	= 70%

*Measured on ASTM dumbbells cut from an 0.080 inch thick molded slab.

Compression Set - (Molded sheets cured 48 hours at 77 F/50% RH.)

25% Compression for 22 Hrs/212 F =	12%
50% Compression for 22 Hrs/212 F =	9%
**50% Compression for 22 Hrs/212 F =	5%

**(This sample given oven post cure of 1 hr/212 F before compression.)

Compression Deflection - (Cured 48 hours at 77 F/50% RH.)

0.125 inch molded slab.
10% Deflection = 0.5 psi load
25% Deflection = 1.0 psi load
50% Deflection = 2.8 psi load

Typical Electrical Properties - (Measured on 0.050 inch thick molded slab.)

Dielectric Strength	147 volts/mil
Dielectric Constant, 10 ² -10 ⁵ cps	1.8
Volume Resistivity	6.6 X 10 ¹⁵ ohm-cm

BLENDING

RTV-7 Foam is compatible with most General Electric RTV products. Variations in properties to fit a specific need may be obtained by adding up to 20 weight percent of another RTV silicone rubber compound to RTV-7 before catalyzation.

Typical Compression Deflection and Density Data - (as determined on the following RTV blend formulations)

RTV Blend Formulation	Sample Thickness	Compression 10%	Deflection 25%	Lbs/In 50%	Density Lbs/Ft ³
RTV-7	0.125"	0.5	1.0	2.9	16.7
RTV-7 + RTV-11 (100 Parts) (25 Parts)	0.125"	0.8	1.9	5.3	19.4
RTV-7 + RTV-60 (100 Parts) (25 Parts)	0.125"	0.8	1.7	5.7	21.2
RTV-7 + RTV-90 (100 Parts) (25 Parts)	0.125"	1.1	2.2	8.3	24.8

CATALYZATION

After mixing the base compound to uniformity, add five to eight weight percent curing agent. Stir vigorously for about 30 seconds. (RTV Foam may be stirred by hand or with mixing equipment specially designed for production line use.) The catalyzed compound begins to foam and cure as soon as mixing is begun and should be poured within 60 seconds from the start to mixing. Expansion and cure are complete within three to four minutes and the foam may be handled within 10 minutes. The time between mixing and cure may be extended by cooling the base compound before catalyzing. Variations of curing agent concentrations, between four and six weight percent, also provide further control of application time.

- Caution
1. RTV Foam is expanded via the evolution of hydrogen gas. The necessary precautions should be taken while the material is foaming.
 2. The curing agent contains stannous octoate which is known to irritate the eyes. Should some catalyst enter the eye, it should be flushed with large amounts of water and proper medical attention should be obtained.
 3. The curing agent is degraded upon exposure to air and moisture. When not in use the container should be kept tightly sealed.

APPLICATIONS/TECHNIQUES

RTV-7 low density silicone rubber foam is used for applications requiring:

1. Mechanical shock and vibration damping.
2. Cast in place thermal insulation.
3. Fabricated/Molded foamed rubber parts.
4. Light-weight electrical insulation.

Molding/Release

When foamed silicone rubber parts are desired, the use of a mold release is suggested for handling ease. Standard polytetrafluoroethylene sprays have been found to give optimum performance. Mold cavities are coated with this release agent before the catalyzed RTV Foam is poured into the molds.

Adhesion

Excellent adhesion of RTV-7 Foam to most substrates is obtained using standard G-E silicone primers such as SS-4004. Substrates to be bonded should be thoroughly cleaned followed by a brush coating of the primer and a usual one hour air dry. The RTV-7 may then be applied and allowed to cure. Foamed RTV-7 will achieve bond strengths exceeding the cohesive strength of the elastomer.

HANDLING AND STORAGE

The catalytic action of RTV-7 is such that it generates flammable gas on contact with acidic, basic, or oxidizing materials. Store in original containers with top up, in a cool place. The room temperature shelf life of this product is in excess of three months from date of shipment. Refrigeration at +40 F will increase shelf life. DO NOT FREEZE.

ORDERING INSTRUCTIONS

Specify quantity and product designation as indicated. Orders should be sent directly to General Electric Company, Silicone Products Dept., Waterford, N. Y., or to the Silicone Products Department sales office nearest you.



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RTV-340

LOW MODULUS RTV SILICONE RUBBER COMPOUND

DESCRIPTION

White medium viscosity room temperature curing silicone rubber compound having low modulus properties which include excellent high elongation, high peel strength, low durometer, and improved resistance to tear.

APPLICATIONS

RTV-340 offers improved rubber performance in the following application areas:

1. Preparation of excellent flexible molds, particularly those for highly intricate patterns with extreme draws and deep undercuts.
2. Sealant against gases, liquid, and dirt where high elongation and high peel strength are needed in addition to broad temperature range and age resistance requirements.
3. Excellent for use in absorbing mechanical shock and vibration because of its low durometer and may also be used to replace sponge in some applications.
4. Electrical potting, encapsulation, and impregnation for electrical and environmental insulation.

TYPICAL PRODUCT PROPERTIES AND DATA

(These values are not to be used for preparing specifications)

A. Uncatalyzed Base Compound

Color	- White
Viscosity Range	- 25,000-65,000 cps at 25°C ⁽¹⁾
Consistency	- Pourable liquid
Specific Gravity	- 1.15
Non-volatile content, %	- 98
% min. (24 hrs. at 158°F)	
Lbs. per Gallon	- 9.6

B. Catalyzed Compound

Compound catalyzed by 5% or 10% by weight of Special paste catalyst RTV-9891. Liquid catalyst RTV-9801 may also be used. (Ref. Section IV Handling)

- (1) Measured with Brookfield RVF Viscometer, #6 Spindle at 10 rpm. Sample stirred before taking reading.

	RTV-340/catalyst at	
	0.5 wt % RTV-9801	10 wt % RTV-9891
Initial Application Rate, g/min. ⁽²⁾	400	700
Application Rate, g/min. ⁽²⁾ (1/2 hr. after catalyzation)	100-125	200
Application Rate, g/min. ⁽²⁾ (1 hr. after catalyzation)	25-50	25-40
Work Time, hours	1-2	1-2
Tack Free Time, hours	3-4	3-4
Hardness, Shore A		
48 hours	15-20	15-20
Weight Loss on Cure, % (at 77°F)		
48 hours	0.06	0.06
1 week	0.09	0.09

C. Cured Compound

1. Physical Properties—
cold pressed ASTM sheets cured 48 hrs/77°F

Catalyst	0.5 wt % RTV-9801	10 wt % RTV-9891
Specific Gravity	1.15	1.15
Hardness, Shore A	15-20	15-20
Tensile Strength, psi	200	210
Elongation, %	300	300
Tear Resistance, Die B, lb/in.	> 40	> 40
Bashore Resilience, %	60	60
Brittle Point, ASTM D-746	Below -100°F	Below -100°F
Peel Strength, lb/in. (bonded to Alclad Aluminum, SS-4004 primed, 10-20 mesh Aluminum Screen used)	12	12

2. Physical Properties - Heat Age

ASTM sheets prepared as above and heat aged in circulating air oven

	24 hrs/ 300°F	24 hrs/ 400°F	24 hrs/ 480°F
Hardness, Shore A	24	25	25
Tensile Strength, psi	280	285	285
Elongation, %	425	400	235

- (2) Application Rate tested by placing catalyzed compound in Semco Sealing gun cartridge with a Semco 440 nozzle with orifice diameter 0.125 ± 0.005 inch attached. A constant air-pressure supply of 90 ± 2 lb/in.² was connected to the gun.

3. Electrical Properties

ASTM sheets prepared as above, plus 24 hours at 23°C (75°F) and 50% RH prior to testing for electrical characteristics.

Dielectric Strength Volts/mil. (60 mil. sheet)	580
Dielectric Constant	
60 cps	2.75
10 ³ cps	2.61
10 ⁶ cps	2.50
Dissipation Factor	
60 cps	.0098
10 ³ cps	.007
10 ⁶ cps	.004
Volume Resistivity Ohm - cm.	2×10^{14}

SUGGESTIONS FOR HANDLING

A. Mixing and Curing

RTV-340 must be cured with either special paste catalyst RTV-9891 or liquid RTV-9801. When using RTV-9891, a 10% by wt. addition is recommended and should give the best cured rubber properties; however, catalyst and concentration may be varied to suit specific applications.

Liquid catalyst RTV-9801 is recommended when working with smaller amounts of RTV-340. Catalyst concentrations of 0.5 to 1.0 wt. % (drops addition to grams of compound) provide cure characteristics and final rubber properties as described by RTV-9891 paste system at the 5% and 10% ratios respectively.

In order to obtain a uniformly cured rubber, it is necessary to mix the curing catalyst thoroughly into the compound. Mixing should be performed in such a manner that a minimum amount of air is entrapped in the compound to eliminate voids. A vacuum treatment may be used to remove air bubbles.

NOTE: 1. This compound-catalyst system cures best under low humidity conditions and in closed molds. High humidity conditions at the time of cure may produce a slightly tacky surface. This tack will disappear in several days. The rubber may be dusted with a talc if it remains a problem. Higher catalyst levels will eliminate this tack condition.

2. Adjusting the ratio of compound to catalyst will provide a variation in work life and cure time characteristics.

B. Thick Section Cure

Excellent thick section cures in closed molds can be achieved by catalyzing RTV-340 with special paste catalyst RTV-9891 or liquid RTV-9801. The aid of heat or exposure of compound to air is not required; however, if faster cure is desired, the part may be heated to 150°F for several hours.

If thick sections of the product are to be used in service over 300°F, the cured product should be temperature conditioned prior to service. A suggested program is four to eight hours at 50°F intervals from 200°F to service temperature. Longer times at each temperature may be required for larger parts.

C. Storage and Shelf Life

RTV-340 should be kept in clean, tightly sealed containers when not in use. Compound should be stirred before using. The useful shelf life is in excess of four months. Refrigeration below 40°F will increase shelf life.

REQUIRED CATALYSTS

RTV-9801 (liquid) and RTV-9891 (paste) are special catalysts required to provide the excellent closed mold-thick section curing characteristics in RTV-340.

Typical Properties

Characteristics	RTV-9801	RTV-9891
Color	clear-light straw	light blue
Consistency	liquid	pourable paste
Viscosity	-	(500 to 850 poises)
Specific Gravity	1.26	1.75

BONDING

RTV-340 will bond to other surfaces by techniques described on page 11 of Technical Data Book S-3C, available upon request. Bond strengths are greater than the rubber itself. Recommended primers are SS4004, SS4044 and SS4101.

ORDERING INSTRUCTIONS

Specify quantity and product and catalyst designation as indicated. Orders should be sent directly to General Electric Company, Silicone Products Department, Waterford, New York or to the Silicone Products Department sales office nearest you.



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RTV-630, RTV-632, RTV-634

ULTRA HIGH STRENGTH RTV's

INTRODUCTION

A new series of General Electric two-package RTV's offers a number of outstanding advantages in applications requiring a silicone rubber compound with increased strength, extraordinary resistance to pressures at high temperatures, and long-term performance capabilities. The product features listed below will open new applications for RTV silicones.

- * Performance capabilities encompassing general industrial applications, model duplication and plastics processing
- * Physical properties equivalent to heat cured silicone rubber
- * Price levels calibrated to match application requirements
- * Reversion resistance
- * Thick section cure
- * Rapid elevated temperature cure
- * Modulus versatility
- * Flame retardance
- * Easy blending
- * Extreme processing stability
- * Resistance to temperature extremes

RTV-630 is the standard bearer of this new series of two-package RTV's. RTV-632 and RTV-634 are complementary products offering easier handling, reduced viscosity and lower cost advantages, with a variation in physical properties profile.

Engineering grade RTV-630, an ultra high strength material, is particularly well suited for plastics thermoforming, casting and embossing applications. A pastel blue pourable liquid in its uncured form, it has a tear strength of approximately 100 lb/in., die B, which compares to about 40 for typical liquid silicone rubbers.

Intermediate RTV-632 can be used for fabricating silicone rubber parts, for potting and encapsulating, and as a high temperature resistant sealant or protective coating for manufactured products. Blue-green in color, it has an intermediate physical properties profile.

Standard grade RTV-634, lowest cost compound in the series, is recommended for making flexible prototype and model molds with limited production run requirements. Green in color, it is an easily pourable liquid.

All three compounds are compatible and can be custom-blended to meet specific physical and viscosity requirements.

PRODUCT DESCRIPTION

RTV-630 - Medium viscosity liquid that cures at room temperature with the addition of a catalyst to form a high tear resistant RTV. RTV-630 develops physical properties similar to standard heat cured silicone rubber while maintaining RTV processing characteristics.

RTV-634 - Low viscosity compound primarily suggested for short run model duplication where physical demands are modest and economy is an important consideration.

RTV-632 - Intermediate viscosity grade made from a blend of 60 parts RTV-630 and 40 parts RTV-634. The RTV-632 offers a compromise on price, handling and physical property profile.

MIXING PROCEDURE

In all cases the product line is composed of A and B portions. The normal mix ratio is 10 parts of A to one part of B. The only exception is with RTV-630 where it is possible to substitute a 15:1 or 20:1 (A:B) mix ratio. This change in mix ratio reduces durometer and produces higher elongation without affecting tear properties. It has been found that optimum mold casting life using epoxies occurs with the 20:1 mix ratio.

WORKING TIME

Upon blending A and B portions a workable viscosity exists for a minimum of two hours at room temperature conditions (75°F). Blending at higher temperatures will decrease working time depending upon the excess in mixing temperature.

DEAERATION

Immediately after mixing A and B portions, air must be removed to prevent bubbles and voids. A reduction pressure to 20 mm or below for 15 to 20 minutes is usually adequate. Please allow for a volume expansion of five times the quantity being deaerated. For best results, raise and lower pressure a number of times to break bubble formation.

In the production of molds, it may be possible to cure in a pressure chamber at 50 to 90 pounds line air pressure. Utilization of this technique eliminates the deaeration step and produces compact, bubble-free molds.

In applications where RTV-632 and RTV-634 are being molded around the prototype, the prototype surface should be painted with the RTV as a further deterrent to surface bubbles. RTV-630, possessing higher viscosity than RTV-632 and RTV-634, does not lend itself well to this application technique.

CURE CYCLES

Sufficient cure is realized in 48 hours at room temperature conditions to permit handling. An elevated temperature post cure is then recommended to quickly develop maximum physicals. One hour at 212°F is adequate for physical property development while an eight-hour post cure is suggested in cases where extended casting cycles are desired for molding epoxy casting resins.

THICK SECTION CURE

At room temperature conditions, section thickness has no bearing on the 48-hour cure cycle. In applications where rapid elevated temperature cures are employed, oven residence time must be sufficient to heat through the silicone rubber.

GENERAL PROPERTIES

	RTV-630	RTV-632	RTV-634
Specific Gravity	1.28	1.24	1.18
Average Viscosity, cps	160,000	48,000	8,000
Color (Pastel)	Blue	Blue-green	Green
Solids	100%	100%	100%
Consistency	Pourable	Pourable	Easily Pourable
Minimum Uncatalyzed Shelf Life	6 months	6 months	6 months

PHYSICAL PROPERTIES*

	RTV-630	RTV-630	RTV-632	RTV-634
Compound/ Catalyst Mix Ratio	10:1	20:1	10:1	10:1
Tensile, psi	850	650	700	400
Elongation, %	300	400	180	220
Tear, Lbs. (Die B)	90	90	50	20
Durometer (Shore A)	70	55	55	35
Linear Shrinkage, % (R.T.)	<.2	<.2	<.2	<.2

*ASTM slabs press cured 30 minutes at 212°F

IMPORTANT CONSIDERATIONS

Extending Mold Life

(a) Epoxy Casting Resins - Amine catalyst used to cross link the epoxy are gradually absorbed by the silicone rubber. Under continued exposure and absorption, a bond develops between the silicone and the epoxy compound. When this condition exists, the silicone mold tears during removal of the cast epoxy part. In order to minimize this effect an occasional bake-out is recommended (8 hours at 300°F) to vaporize the amine contaminants.

Another approach would be to dress the mold surface with a silicone diluent, RTV-910. This treatment is effective and will prolong mold life; however, it does leave a silicone film on the cast epoxy part which may have to be removed prior to painting.

(b) Vinyl Plastics - Conventional PVC plasticizer like amine catalysts are capable of being absorbed by the silicone rubber. Failure eventually occurs, due to the gradual decrease in the silicone physical properties resulting in deterioration of the mold surface. Once again a bake-out is recommended (8 hours at 350°F) to minimize plasticizer effect.

Cure Inhibition

RTV-630, RTV-632 and RTV-634 are compatible compounds utilizing the same type of catalyst system. Certain prototype materials such as butyl and chlorinated rubber, sulfur compounds, amines and metal soap cured RTV's are able to inhibit cure. Cure inhibition can best be described as a surface condition whereby the silicone remains tacky to a depth of approximately five mils.

One method of circumventing this problem is to utilize a barrier coat (SS-4150) along with a room temperature cure for the silicone rubber. Elevated temperature cures are not recommended since contaminants within the prototype or master are prone to vaporize through the barrier coat into the silicone rubber.

Another worthwhile preventative is cleaning of metal or plastic masters with xylene or toluene if prior contact has been made with sources of inhibition.

STORAGE AND HANDLING PROBLEMS

Neither the A nor B portions are known to produce any toxic effect upon contact with the skin. These materials should be stored in clean, tightly closed containers in a cool, dry place.

The A and B portions can generate flammable gas on contact with acidic, basic or oxidizing materials, and such contact should be avoided.

ACCESSORY ITEMS

Primer SS-4120

With the use of Primer SS-4120 RTV-630, RTV-632 and RTV-634 can be bonded to most substrates. The surface to be bonded must be clean and dry. If surfaces are resistant to solvent cleaning, a trichlorethylene wash is suggested. Surface roughening will improve the bond to metals.

The primer is applied by brushing, spraying or dipping. Film thickness should be between 0.1 and 0.3 mils, typical of that obtained with one dip, or a single brushing. Films greater than 0.5 mils in thickness show decreased bond strength.

The primer should be allowed to air dry for one hour before the compound is applied.

Primer SS-4120 is supplied in a methanol solvent. Methanol is flammable and poisonous. Keep SS-4120 away from heat, sparks and open flame. Keep container closed, use only with adequate ventilation and avoid breathing of vapor.

Barrier Coat SS-4150

Barrier coat SS-4150 is recommended for substrate coating where the substrate could inhibit cure of RTV-630, 632 and 634. The barrier coat is easily applied in a uniform continuous film by either dipping or brushing.

Resultant coat will be pale blue in appearance with a film thickness of approximately one mil. Properly applied,

the coating will prevent substrates, such as rubber, vinyl and epoxy, from inhibiting room temperature cure of subject silicone compounds. The barrier coat easily releases from the silicone.

Rapid elevated temperature cures may often be employed depending on the type of contaminant involved.

Diluent RTV-910

The RTV-910 is a dimethyl silicone fluid which serves a dual purpose for the tool or model maker. Its primary contribution is that of a viscosity depressant. Addition of up to 5% of RTV-910 will lower viscosity at some sacrifice in physical properties of the silicone rubber.

A secondary function of RTV-910 is for wipe-on treatment of silicone rubber molds. Occasional surface application will improve release of epoxy cast parts. Frequency of use will depend on the intended purpose for which the epoxy part is being made. If a subsequent paint coat is planned steps must be taken to solvent clean (xylene, trichlorethylene) the epoxy part to remove residual RTV-910 from the surface.



supplementary data

ONE PACKAGE - LIQUID RTV SILICONE
RUBBER SEALANT

RTV-118 is a precatalyzed translucent RTV liquid silicone rubber. Having a low viscosity (approximately 350 poises) in the uncured state, this material is readily pourable and offers self-leveling characteristics. Ready to use, it cures at room temperature to a firm, flexible, resilient rubber on exposure to moisture from the air. The sealant contains no solvent, cures with very little shrinkage and adheres to most surfaces without the aid of a primer.

APPLICATIONS

Applications may consist of thin film rubber impregnation by dipping or brushing, potting of detailed electrical terminals and apparatus by pouring, and thin film rubber coatings for mechanical protection that may be applied by brushing or spraying.

TYPICAL PRODUCT PROPERTIES
(Not for use in preparing specifications)

Uncured Properties

Color	Translucent
Specific Gravity	1.06
Solids Content	Contains No Solvents
Non-Volatiles, % (24 Hrs/158 F)	97
Flow	Self-Leveling
Viscosity, Poises	350
Application Rate, gm/min. (Semco Gun with #440 Nozzle 0.125 Orifice)	
Gun Pressure: 20 $\pm$ 2 psi	100
90 $\pm$ 2 psi	600

Curing Characteristics

Curing takes place on exposure to air, forming a skin on the surface, and progressing through the material with time. The material becomes tack-free in approximately 30 minutes and cures through a 1/8-inch section in 24 hours at 77 F and 50 percent relative humidity. Lower temperature and humidity will slow the rate of cure. Higher temperatures and humidity will accelerate the cure. The optimum cure conditions are 90 F and 90 percent RH.

During initial stages of cure a noticeable odor caused by acetic acid is produced. This odor will disappear after complete cure. When using RTV-118 on electrical or electronic parts, a preliminary check is suggested to determine the effects of small amounts of acetic acid on the specific components.

Priming exposed surfaces with an RTV silicone primer

(SS-4004, SS-4044, or SS-4101) reduces the possibility of corrosion resulting from the liberated acetic acid.

Physical Properties

(ASTM pressed sheets cured at 77 F and 50 percent RH.)

	2-Day Cure	7-Day Cure
Hardness, Shore A	25	27
Tensile Strength, psi	500	520
Elongation, %	400	350
Tear Strength, Die B, LB/In.	35	33
Linear Shrinkage, %	0.2	0.3
Specific Gravity	1.06	1.06

Effects of Heat Aging

RTV-118 withstands temperatures from -85 F to +300 F for extended periods and up to +500 F for shorter time periods. (Typical data obtained on ASTM pressed sheets cured one week at 77 F and 50 percent RH.)

Property	Time at Temperature (After One Week Cure)			
	1 Wk/ 77 F	24 Hrs/ 300 F	24 Hrs/ 350 F	24 Hrs/ 400 F
Hardness, Shore A	27	26	25	26
Tensile Strength, psi	520	450	440	400
Elongation, %	350	300	290	280
Tear, Die B, Lb/In.	33	30	30	33
% Weight Loss	---	0.8	2.3	2.7

Electrical Properties

(ASTM pressed sheets cured one week at 77 F and 50 percent RH. Specimens conditioned 24 hours/23 C and 50 percent RH prior to electrical testing.)

Dielectric Strength, Volts/Mil (approx 65 mil) 1 inch Electrode	542
Dielectric Constant	
60 Cps	2.70
10 ³ Cps	2.65
10 ⁶ Cps	2.60
Dissipation Factor	
60 Cps	.0004
10 ³ Cps	.0004
10 ⁶ Cps	.0018

Volume Resistivity, ohm-cm

2 X 10¹⁵

Adhesion

Adhesion is attained on most clean surfaces without the aid of a primer. The adhesive bond improves with time during cure. Within a few days the bond strength becomes greater than the cohesive strength of the rubber.

Typical bond strength data available on limited test samples to date are as follows:

Substrate ¹	Adhesive Characteristics, Properties			
	Shear Strength*		Peel Strength**	
	psi	% Cohesive Failure	Lb/In.	% Cohesive Failure
Unprimed				
Copper	170	100	---	---
Aluminum 2024-T6	170	100	20	100
Glass	(2)	100	---	---
Clear Acrylic	(2)			
Primed - SS-4004				
Aluminum 2024-T6	140	100	20	100
Stainless Steel #304	140	100	---	---
Steel - Cold Roll #SE-1010	140	100	20	100
¹ 20-mesh stainless steel screen bonded to substrate listed. ² Specimen broke in test. *70 hour cure at 77 F and 50% RH. **7 day cure at 77 F and 50% RH				

Due to the various types of bond strengths required for different applications and the unlimited number of possible substrates, it is suggested that a preliminary check be made to determine the bonding effects of RTV-118 with specific materials.

For extremely difficult to bond surfaces such as nickel and stainless steel the use of a primer is recommended prior to RTV-118 application. (SS-4004, SE-4101 or SS-4044.)

STORAGE AND SHELF LIFE

RTV-118 is commercially available in three-ounce and 12-ounce collapsible aluminum tubes, six-ounce plastic cartridges and in bulk containers. In the original-sealed containers and stored at temperatures below 80 F, the useful shelf life of this material will be at least 12 months.

To prevent any curing within the tube, wipe off all excess material around the nozzle after each application and keep TIGHTLY sealed. If a small amount of cured rubber does form around the opening during exposure to air, it can easily be removed and will not affect the remainder of material in the tube.

SPECIFICATIONS

The properties shown have been determined from laboratory tests and are typical of the products. However, a reasonable degree of variation will occur in commercially produced material. The typical values shown here should not be used as a basis for specifications. Please contact the Silicone Products Department at Waterford, New York for assistance and recommendations in the preparation of a material specification for RTV-118.

Standard test procedures developed for the rubber industry are frequently used in measuring silicone elastomers. The following standard tests have been used in obtaining test data shown here:

Specific Gravity	ASTM D-792
Durometer, Hardness, Shore A	ASTM D-676
Tensile Strength and Elongation	ASTM D-412
Tear Resistance	ASTM D-624
Dielectric Constant and Dissipation Factor	ASTM D-150
Dielectric Strength	ASTM D-149
Volume Resistivity	ASTM D-257

ORDERING INFORMATION

Specify quantity and product designation as indicated. Refer to General Electric RTV-118 Price Schedule for current price and packaging information. Orders should be sent directly to General Electric Company, Silicone Products Department, Waterford, New York, or the nearest G-E silicone sales office or from your authorized G-E silicone distributor.



TECHNICAL DATA BOOK

S-2C

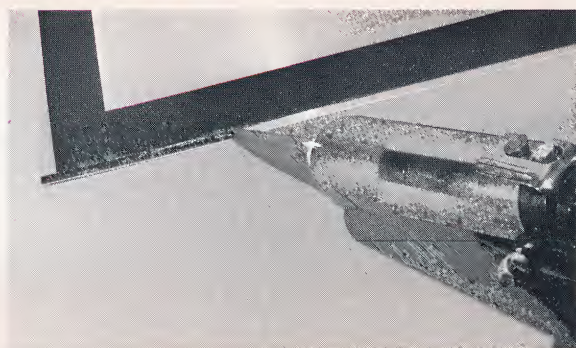
SILICONES

SILICONE RUBBER ADHESIVE/SEALANTS for Industrial Applications

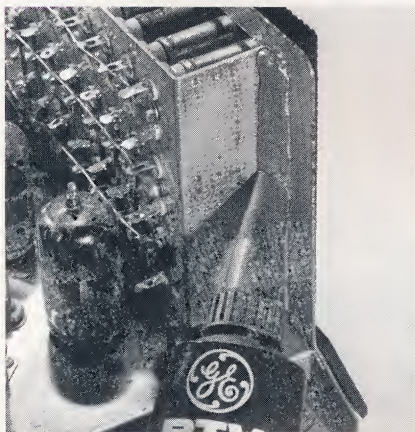
High Temperature RTV-106



Black RTV-103

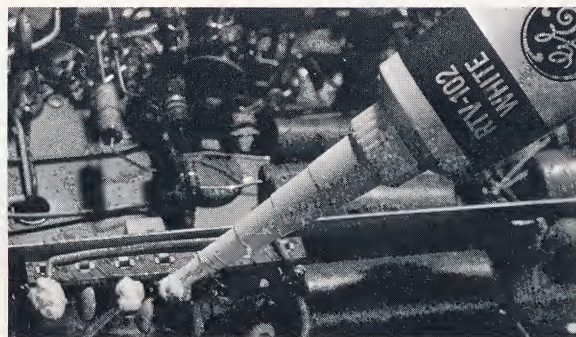


Translucent RTV-108



Aluminum RTV-109

White RTV-102



Pourable RTV-112

GENERAL  **ELECTRIC**

SILICONE PRODUCTS DEPARTMENT
WATERFORD, NEW YORK



a complete line of silicone rubber

GENERAL INFORMATION

Only one elastomeric material — silicone rubber — has proved to be virtually immune to ozone, ultraviolet light, severe temperature change and oxidation through years of rough service. Originally developed by General Electric Research Laboratories for sealing space capsules, silicone rubber adhesive/sealants have now entered America's industries solving problems once considered impossible. How can this be? The answer lies in silicone rubber's amazing properties.

- **RESISTANCE TO MOISTURE AND AGING** — resistance to long time weathering.
- **PERMANENTLY FLEXIBLE** — never hardens, cracks or dries out.
- **MINIMUM SHRINKAGE** — containing no solvents and curing with the least amount of shrinkage.

There are other properties which make General Electric Silicone Rubber especially suited for industry.

- **EASY APPLICATION** — available in either *thixotropic* (def.—a substance whose properties are affected by a mechanical action—*i.e.* flows under pressure) and applied as toothpaste or the new *pourable* adhesive/sealant with the viscosity of paint. Thus in most instances the *thixotropic* materials would be selected where no sagging or flowing could be tolerated as on overhead or vertical surfaces. On

other occasions such as a production line use, the new *pourable* adhesive/sealant would be best.

- **NO MIXING** — apply direct from the tube without adding a catalyst.
- **AIR CURES** — cures to a resilient rubber at room temperatures and thus their name RTV—Room Temperature Vulcanizing.
- **EXCELLENT BONDS WITHOUT PRIMER** — RTV adhesive/sealants bond automatically to many materials including glass, aluminum, steel, ceramics, leather, some plastics and many others. In some instances on difficult surfaces primer may improve the bond.

In addition to these, RTV adhesive/sealants have other properties which make them especially valuable in industrial applications.

- **GOOD ELECTRICAL PROPERTIES** — remaining essentially constant even during curing cycles.
- **LOW TEMPERATURE FLEXIBILITY** — remaining flexible even at temperatures below -75°F. At these low temperatures modulus increases but silicone rubber does not become brittle.
- **HIGH TEMPERATURE PROTECTION** — withstanding temperatures up to 300°F in extended periods and up to 500°F for shorter time periods. For extreme high temperature long time operation at 600°F, RTV-106 is recommended.

PRODUCT SELECTION

General Electric offers a complete family of ready-to-use, one package RTV adhesive/sealants for many industrial applications.

TYPE	PRODUCT	COLOR	TYPICAL APPLICATION
General Purpose Industrial Use (Thixotropic)	RTV-102	White	Affixing name plates
	RTV-103	Black	Rubber repair
	RTV-108	Translucent	See through insulation
	RTV-109	Aluminum	Metal bonding
Extreme High Temperature	RTV-106	Red	Critical "high-temp" use
General Purpose Industrial Use (Pourable)	RTV-112	White	Brushing or spraying on a production line basis.

Packaged in collapsible aluminum squeeze tubes, plastic cartridges and in one and five gallon pails, GE Adhesive/Sealants are easily applied by several techniques ranging from simple dispensing to automatic production line equipment.

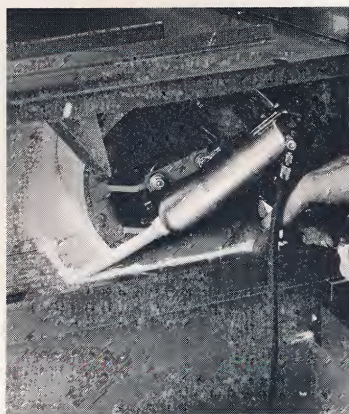
adhesive/sealants

INDUSTRIAL USES...

Applications unlimited for GE Silicone Adhesive/Sealants to serve you.



2. RTV seals filament condenser plates in dielectric heaters. Reasons: RTV resists high temperature, insulates electrically, locks out conductive contamination.



1. RTV bonds vent units and ducts in new Hot-point range, seals areas of metal-to-metal contact to prevent escape of cooking vapors. RTV is damping medium for vent motor, reducing sound and vibration.



4. RTV bonds sheeting into desired configuration in low volume production of cylindrical air ducts for dielectric heaters. Results: production costs cut more than 300%.



3. RTV fills gaps and hairline crevices in food processing equipment. RTV ingredients have been F.D.A. sanctioned.



5. RTV laminates layers of mica sheeting and plates in production of plate condensers. Results: improved operational reliability, assembly time cut from 24 hours to 20 minutes.



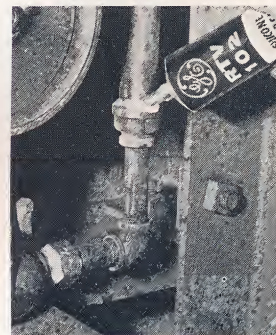
6. RTV eliminates need for screws and drilling when used to affix name plates and decorative emblems on any surface. Results: no unsightly rust drainage; plates stay put indefinitely, but can be cut loose when desired.



7. RTV joins the edges of two castings in a yard cleaning machine. The maker eliminated much machining for the surfaces need not be flush to each other. RTV also saved \$4000 over alternate sealing methods.



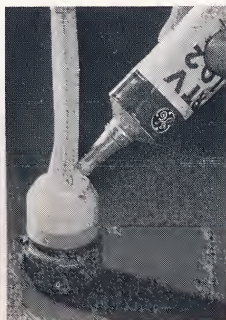
8. RTV-108 provides instant, "see-through" insulation as well as vibration resistance and environmental protection. RTV needs no pre-mixing; is applied directly from the tube.



9. RTV-102 provides quick relief from low pressure leaks. Silicone Rubber RTV's are water proof and provide excellent protection during a wide temperature range.



10. RTV seals glass and plastic instrument lenses against dirt and moisture. RTV-102 is easily applied and will not sag.



11. RTV seals A&N connectors, terminals, and wire harness joints and other flexible parts. It will absorb shock and vibration eliminating the fatigue failure of connections.



12. RTV-106 can be used for gasket repair or gasket sealing where high temperatures would prohibit normal sealant use.

THIXOTROPIC RTV SILICONE RUBBER FOR . . .

general purpose industrial use

RTV-102	White
RTV-103	Black
RTV-108	Translucent
RTV-109	Aluminum

Because of many advantages including easy application and wide color selection, these four GE adhesive/sealants are ideal for an unlimited number of industrial applications.

Uncured Properties

Consistency	Soft, spreadable thixotropic paste
Color	White, black, aluminum, translucent (see above)
Specific Gravity	1.07
Solids Content	Contains no solvent.
Non Volatiles % (24 hrs/158°F)	92% (min.)
Flow (Mil-S-8802B)	Nil (0.1 inch max.)
Tack Free Time (77°F, 50% R.H.)	30 minutes
Application Rate gm/min. (Semco Gun with #440 Nozzle 0.125 orifice)	
Gun Pressure 90 ± 2 psi	200-500

Physical Properties

(ASTM pressed sheets cured at 77°F and 50 percent R.H.)

Property	7-Day Cure
Hardness, Shore A	30
Tensile Strength, psi	350
Elongation, %	400
Tear Resistance, Die B, lb/in.	45
Linear Shrinkage, %	1.0
Specific Gravity	1.07

Heat Aging Data

(Typical data obtained on ASTM pressed sheets cured one week at 77°F and 50 percent R.H.)

Property	Time at Temperature (after one week cure)				
	1 wk/ 77°F	24 hr/ 300°F	1 wk/ 300°F	24 hr/ 350°F	24 hr/ 400°F
Hardness, Shore A	30	35	33	36	43
Tensile Strength, psi	350	385	450	425	250
Elongation, %	400	400	400	475	200

Electrical Properties

(ASTM pressed sheets cured 10 days at 77°F and 50 percent R.H. Specimens conditioned 24 hours at 75°F and 50 percent R.H. prior to electrical testing.)

Dielectric Strength, Volts/Mil	
Thickness .058"	550
Thickness .103"	425
Dielectric Constant	
60 Cps	2.8
10 ³ Cps	2.7
10 ⁶ Cps	2.6
Dissipation Factor	
60 Cps	0.0026
10 ³ Cps	0.0026
10 ⁶ Cps	0.0026
Volume Resistivity ohm-cm	3 × 10 ¹⁵

Bonding

See general characteristics of RTV adhesive/sealants on page 7. Typical bond strength data available on test samples are as follows:

Substrate*	Adhesive Characteristics, Properties			
	Shear Strength†		Peel Strength‡	
	psi	% Cohesive Failure	lb/in.	% Cohesive Failure
Unprimed Alclad Aluminum 2024-T6 per QQ-A-362	200	95-100	20	90-95
Primed—SS-4004 Alclad Aluminum 2024-T6 per QQ-A-362	200	100	20	100

*20-mesh stainless steel bonded to substrate listed

†70 hour cure at 77°F and 50% R.H.

‡7 day cure at 77°F and 50% R.H.

Similar values of adhesive strength have been obtained on such materials as anodized and alodized aluminum, copper, titanium, glass, epoxy resin, ML* polymer, brass, silver, carbon steel, Lexan® polycarbonate resin, Textolite®, and silicone rubber (both heat cured and RTV types).

*T. M. DuPont

high temperature industrial use

RTV-106 | Red

RTV-106 is recommended for extreme high temperature applications. This product is specially formulated and processed to perform at temperatures up to 600°F with relatively little change in physical properties.

Uncured Properties

Consistency	Soft, spreadable thixotropic paste
Color	Red
Specific Gravity	1.07
Solids Content	Contains no solvent
Non Volatiles % (24 Hrs/158°F)	96% (min.)
Flow (Mil-S-8802B)	Nil (0.1 inch max.)
Tack Free Time (77°F, 50% R.H.)	30 minutes
Application Rate gm/min. (Semco Gun with #440 Nozzle 0.125 orifice)	
Gun pressure 90 ± 2 psi	200-500

Physical Properties

(ASTM pressed sheets cured at 77°F and 50 percent R.H.)

Property	2-Day Cure
Hardness, Shore A	33
Tensile Strength, psi	350
Elongation, %	400
Tear Resistance, Die B, lb/in.	50
Linear Shrinkage %	<0.5
Specific Gravity	1.07

Electrical Properties

(ASTM pressed sheets cured 10 days at 77°F and 50 percent R.H. Specimens conditioned 24 hours at 75°F and 50 percent R.H. prior to electrical testing.)

Dielectric Strength, Volts/Mil	
Thickness .058"	550
Thickness .103"	425
Dielectric Constant	
60 Cps	2.8
10 ³ Cps	2.7
10 ⁶ Cps	2.6
Dissipation Factor	
60 Cps	0.0026
10 ³ Cps	0.0026
10 ⁶ Cps	0.0026
Volume Resistivity ohm-cm	3 x 10 ¹⁵

Heat Aging Data

(Typical data obtained on ASTM pressed sheets cured one week at 77°F and 50 percent R.H.)

Property	Time at Temperature (after one week cure)					
	48 hr/ 77°F	24 hr/ 480°F	1 wk/ 480°F	24 hr/ 600°F	1 wk/ 600°F	2 wk/ 600°F
Hardness, Shore A	33	28	28	30	45	65
Tensile Strength, psi	350	370	390	325	420	475
Elongation, %	400	550	540	500	300	180
Tear, Die B, lb/in.	50	47	43	43	40	40
Linear Shrinkage, %	<0.5	2.5	2.5	4.0	9.0	16.0
Weight Loss, %	...	4.7	5.2	11.9	23.4	40.6

Bonding

RTV-106 High Temperature Industrial Adhesive/Sealant is similar in bonding properties to General Purpose Industrial (Thixotropic) type. For bond strengths see the bonding section of that product or the general bonding characteristics on page 7.

POURABLE RTV SILICONE RUBBER FOR . . .

general purpose industrial use

RTV-112 I White

RTV-112 is a precatyzed RTV liquid silicone rubber. Having a low viscosity (approximately 300 poises) in the uncured state, this material is readily pourable and offers self-leveling characteristics. Ready to use, it cures at room temperature to a firm, flexible, resilient rubber on exposure to moisture from the air. The sealant contains no solvent, cures with very little shrinkage and adheres to most surfaces without the aid of a primer.

Uncured Properties

Consistency	Pourable, like paint
Color	White
Specific Gravity	1.05
Solids Content	Contains no solvents
Non-Volatiles, % (24 Hrs/158°F)	95% (min.)
Flow	Self-Leveling
Viscosity, Poises	300
Application Rate gm/min. (Semco Gun with #440 Nozzle 0.125 orifice)	
Gun Pressure: 20 ± 2 psi	200
90 ± 2 psi	1300
Tack Free Time (77°F, 50% R.H.)	30 minutes

Physical Properties

(ASTM pressed sheets cured at 77°F and 50 percent R.H.)

Property	2-Day Cure	7-Day Cure
Hardness, Shore A	30	32
Tensile Strength, psi	250	350
Elongation, %	300	350
Tear Strength, Die B, lb/in.	25	25
Linear Shrinkage, %	1	1
Specific Gravity	1.05	1.05

Electrical Properties

(ASTM pressed sheets cured one week at 77°F and 50 percent R.H. Specimens conditioned 24 hours at 75°F and 50 percent R.H. prior to electrical testing.)

Dielectric Strength Volts/Mil thickness .065"	542
Dielectric Constant	
60 Cps	2.70
10 ³ Cps	2.65
10 ⁶ Cps	2.60
Dissipation Factor	
60 Cps	.0004
10 ³ Cps	.0004
10 ⁶ Cps	.0018
Volume Resistivity ohm-cm	2 × 10 ¹⁵

Heat Aging Data

(Typical data obtained on ASTM pressed sheets cured one week at 77°F and 50 percent R.H.)

Property	Time at Temperature (after one week cure)			
	1 Wk/ 77°F	24 Hrs/ 300°F	24 Hrs/ 350°F	24 Hrs/ 400°F
Hardness, Shore A	32	32	30	28
Tensile Strength, psi	350	320	300	280
Elongation, %	350	300	290	280
Tear, Die B, lb/in.	25	28	30	33

Bonding

See general information concerning bonding characteristics of all GE Adhesive/Sealants on page 7. Bond strengths of RTV-112 are somewhat less than the bond strengths of General Purpose Industrial Use (Thixotropic) RTV's. Typical bond strength data available on RTV-112 follows:

Substrate*	Adhesive Characteristics, Properties			
	Shear Strength†		Peel Strength‡	
	psi	% Cohesive Failure	lb/in.	% Cohesive Failure
Unprimed				
Copper	90-100	100		
Aluminum 2024-T6	80-90	95-100	6	90
Glass	**	100		
Clear Acrylic	**	100		
Primed — SS-4004				
Aluminum 2024-T6	140	100	8	100
Stainless Steel #304	140	100		
Steel — Cold Roll #SE-1010	140	100	8.5	100

*20-mesh stainless steel screen bonded to substrate listed.

**Substrate broke before bond failed.

†70 hour cure at 77°F and 50% R.H.

‡7 day cure at 77°F and 50% R.H.

GENERAL APPLICATION and HANDLING SUGGESTIONS

Applying

RTV adhesive/sealants are applied directly from the tube and will air cure without any application of heat. They first form a surface skin with a complete cure progressing through the material. Under typical ambient conditions, they develop a tack-free surface in 15 to 30 minutes and cure through a 1/8 inch thickness in less than 24 hours. Lower temperatures and humidity will slow the rate of cure. Higher temperatures and humidity will accelerate the cure. (Most optimum conditions are 90°F and 90% R.H.).

During initial stages of cure, a noticeable odor caused by acetic acid is produced. This odor will completely disappear at a later stage of cure. When using RTV on electrical or electronic parts, a preliminary check is suggested to determine the effects of small quantities of acetic acid on the specific component. In most cases, priming the part prior to applying the RTV will prevent any possibility of corrosion.

General Electric adhesive/sealants are designed and packaged for easy industrial application. For information concerning automatic dispensing for production line use, write for Technical Information Reports TSR-1711, TSR-1712 and appropriate CDS-598 equipment catalogues.

Bonding

RTV adhesive/sealants will bond to most clean surfaces without the aid of a primer. When cleaning, use a suitable solvent such as toluene, xylene, or acetone to remove all dirt and grease. When practical, wipe the surface dry with a clean cloth or paper towel prior to applying the sealant. Most materials can be bonded without priming (most metals, glass, ceramics, silicone rubber and many rigid plastics). Adhesion is obtained merely by applying RTV directly to the clean substrate, completely covering the entire surface, and allowing it to air cure.

The bond will improve with time—tests have shown that after three weeks the bond strength exceeds the cohesive strength of the rubber itself.

RTV will produce fair bonds with adhesive rather than cohesive failure to organic rubbers or flexible plastics that do not contain fugitive plasticizing agents.

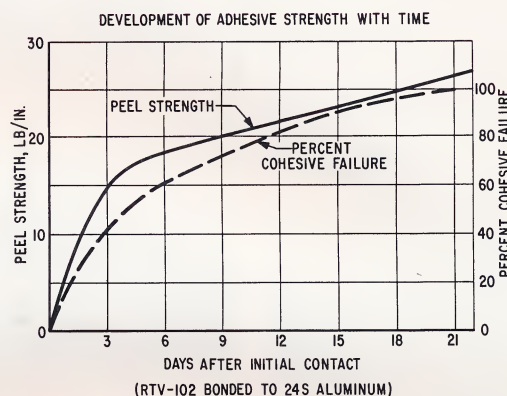
Due to the various types of bond strength required for different applications, it is suggested that a preliminary check be made to determine the bonding effects of RTV with specific materials.

Surface Preparation

When cleaning, use a suitable solvent such as toluene, xylene, or acetone to remove all dirt and grease. When practical, wipe the surface dry with a clean cloth or paper towel prior to applying the sealant.

Cure Time

The time required for RTV to form a maximum bond will vary according to type and thickness of material, humidity, temperature, etc. When bonding non-porous substrates, a one inch width of RTV will completely cure within three weeks at ambient temperatures and humidities. Frequently, enough adhesion will develop within 60 minutes or less to permit handling the part. However, no appreciable stress should be exerted on the bond until it develops its full adhesive strength. If possible, allow three weeks for optimum results.



Clean Up and Removal

Before cure, solvent systems such as chlorinated hydrocarbons or aromatic hydrocarbons such as xylene are most effective.

After cure, chemical paint strippers such as Ordcostrip® No. 1 (from Oreland Research Co., Phila., Pa.) or Epoxystrip® No. T-251-C (from Beck Equipment & Chemical Co., Cleveland, Ohio) are very effective for removing well bonded RTV adhesives.

For additional information refer to Technical Information Report TSR-1709.

Storage and Shelf Life

RTV adhesive/sealants are commercially available in 3 and 12 ounce collapsible aluminum tubes, in 6 and 12 ounce plastic cartridges, and in bulk containers for use with automatic pressure guns and dispensing equipment. In their original aluminum tubes and stored at temperatures below 80°F, the useful shelf life will be in excess of one year from date of shipment. A 12 month's shelf life may be expected in the plastic cartridges.

To prevent any curing within the tube, wipe off all excess material around the nozzle after each application and keep tightly sealed. If a small amount of cured RTV does form around the opening during exposure to air, it is easily removed and will not affect the remainder of material in the tube.

Standards

Standard test procedures developed for the rubber industry are frequently used in measuring silicone elastomers. The following standard tests have been used in obtaining test data shown here:

Specific Gravity	A.S.T.M.	D-792
Durometer, Hardness, Shore A	A.S.T.M.	D-676
Tensile Strength and Elongation	A.S.T.M.	D-412
Tear Resistance	A.S.T.M.	D-624
Dielectric Constant and Dissipation Factor	A.S.T.M.	D-150
Dielectric Strength	A.S.T.M.	D-149
Volume Resistivity	A.S.T.M.	D-257

Specifications

The properties shown in this data book have been determined from laboratory tests and are typical of the products. However, a reasonable degree of variation will occur in commercially produced material. The typical values shown here should not be used as a basis for specifications. For assistance and recommendations in the preparation of specifications, please contact the Silicone Products Department at Waterford, New York. Publication CDS-372 and CDS-351, "Adhesive/Sealant Specification Guides" are available upon request.

General Electric RTV Silicone Rubber Adhesive/Sealants may be ordered from your nearest G-E Silicone Sales Office or from your authorized G-E Silicone Agent or Distributor.

Inasmuch as General Electric Company has no control over the use to which others may put the material, it does not guarantee that the same results as those described herein will be obtained. Each user of the material should make his own tests to determine the material's suitability for his own particular use. State-

ments concerning possible or suggested uses of the materials described herein are not to be construed as constituting a license under any General Electric patent covering such use or as recommendations for use of such materials in the infringement of any patent.

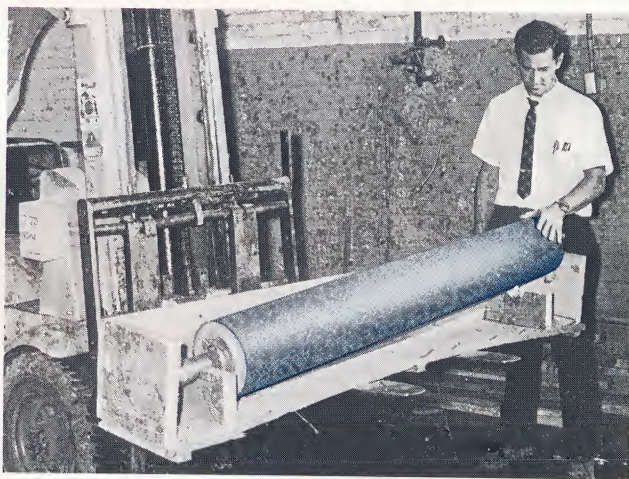
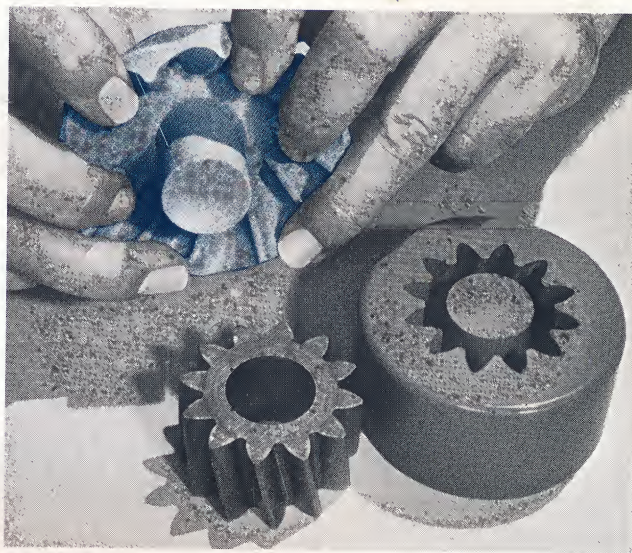


SILICONES

TECHNICAL DATA BOOK **S-29A**

RTV SILICONE RUBBER

FOR PLASTICS CASTING AND THERMOFORMING



GENERAL  ELECTRIC

SILICONE PRODUCTS DEPARTMENT
WATERFORD, NEW YORK



SILICONES

RTV-630

For Plastics Processing

NOW, FOR THE FIRST TIME . . .

**A RAPID-CURE REVERSION-RESISTANT LIQUID SILICONE
TO SPEED PRODUCTION . . . PROVIDE HIGH-FIDELITY CASTINGS . . .
CUT PRODUCTION COSTS**

General Electric now introduces a new ultra-high strength, high durability two-package RTV compound specially developed for rapid fabrication techniques in a range of plastics processing applications. The superior physical profile of the new compound—RTV-630—is the basis for new and heretofore unachievable production and end-product values, particularly for thermoforming and casting operations in plastic parts processing.

Briefly, here are some of the more significant features and benefits of this new RTV compound:

PRODUCTION ECONOMY

Twice as strong as previously available silicone compounds, thermoforming tools and flexible molds made from RTV-630 require less silicone and provide longer use life.

FAST CURE

Well suited for production line use, molds of any thickness can be cured quickly in as little time as 30 minutes at 300°F . . . or if desired, compound can be cured at room temperature in 48 hours.

SUGGESTED APPLICATIONS IN PLASTICS PROCESSING

RTV-630 silicone rubber compounds are designed for use with a range of plastics—including polyvinyl chlorides, epoxies, polyesters, acrylics and styrenes—where thermoforming and casting techniques are employed. This RTV compound can be used as a production tool or mold making material in the fabrication of —

- Textured Films
- Embossed Floor Products
- Customized Marine and Automotive Components
- Thermoformed Structural Parts for Aerospace Vehicles

EASY HANDLING

Typical mixing ratio of curing agent to compound is one part curing agent to 10 parts compound, with mixing by hand or by automatic equipment.

EXTREME PROCESSING STABILITY

RTV-630 withstands the rigors of the most punishing production conditions with little or no effect . . . even after extended exposure to 5000 psi pressures at 350°F, it resists reversion and other forms of deterioration.

THICK SECTION CURE

RTV-630 will cure in deep section in completely closed molds . . . with no exotherm during cure and virtually no shrinkage.

OTHER FEATURES

RTV-630—as well as RTV-632 and RTV-634 described below—are characterized by flame retardance, resistance to temperature extremes and outstanding electrical properties.

RTV-630 SERIES COMPOUNDS CAN BE USED IN PROTOTYPE MOLD, POTTING- ENCAPSULATING AND GENERAL PURPOSE APPLICATIONS

RTV-630 is the standard bearer of this new series of two-package RTVs. RTV-632 and RTV-634 are complementary products, offering easier handling, reduced viscosity, and lower cost, with a variation in physical property profile.

The three compounds are compatible and can be custom-blended to meet specific physical and viscosity requirements. Among suggested applications of these compounds: as a non-stick, high temperature-resistant coating for conveyor belts in processing and handling of tacky chemicals, foods and other products; as a high temperature sealant in manufactured products; as a protective covering for products requiring insulation from extreme heat, moisture and other environmental extremes; for flexible prototype or model molds; as a potting-encapsulating medium; for fabrication of silicone rubber parts.



SILICONES

FOR PLASTICS PROCESSING

INCREASED PRODUCTION... IMPROVED PRODUCT QUALITY IN PLASTICS PROCESSING

RTV-630 is a unique product with a physical properties profile equivalent to that of heat cured rubber. Its superior strength and durability are augmented by outstanding reversion resistance, rapid and thick section cure capabilities, and modulus control. These performance qualities are the basis for new concepts in plastics thermoforming and casting.

Examples, taken from engineering trials, illustrate RTV-630's capabilities as a production tool in plastics processing.

THERMOFORMING STRUCTURAL PARTS FOR AEROSPACE VEHICLES

In the fabrication of structural parts for aerospace vehicles, RTV-630 is molded into a male punch die to serve as a core for a reinforced epoxy lay-up. Lay-up is hand-formed over a female metal mold, the RTV die is inserted in the female mold and the part is thermoformed at 350°F and 5000 psi.

Conventional silicone rubber, previously utilized as the male punch die, could not withstand punishment of extreme heat and pressure, with reversion of the material often occurring after one cycle. In addition, molded parts formed with conventional silicone required machining to remove surface irregularities. The punch die made from RTV-630 outperformed conventional RTV silicone by more than six-to-one with no visible signs of fatigue or deterioration.

PRODUCTION MOLDING OF CAST EPOXY

In the production of cast epoxy for electronic modules, multi-cavity flexible molds of RTV-630 have replaced similar molds of conventional RTV silicone rubber. Conventional silicone molds had to be replaced after 35 castings because of surface deterioration by tearing and abrasion. RTV-630 molds, by contrast, performed for more than 70 castings without material breakdown. Optimum results were obtained with a 20:1 mix ratio of compound to curing agent.

EMBOSSING VINYL FILM

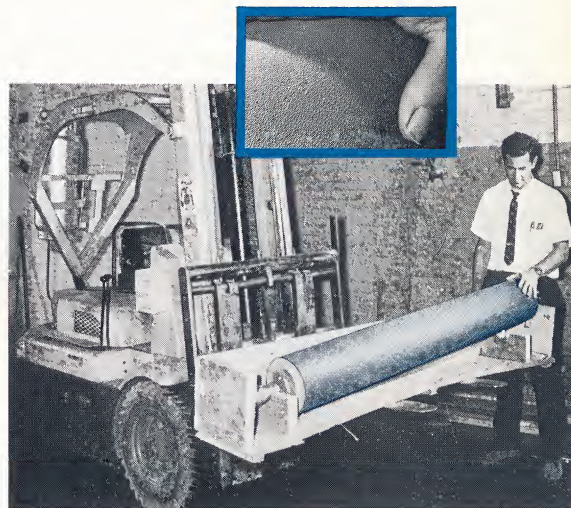
Used as an impression carrier for embossing rolls, RTV-630 replaces costly etched metal rolls for plastic film processing. Shown below is an RTV-630 production roll for embossing vinyl film used as automotive head liners.

Roll was made at a cost of \$200 and took less than 10 man-hours to produce. Comparable engraved steel roll would have cost about \$3000, requiring about 90 days for delivery. RTV-630's fast cure capabilities make possible rapid style change-over in the production of embossed plastics.



Conventional RTV mold (left) shows tearing and pitting after a limited number of castings, while RTV-630 mold shows no signs of breakdown after extended exposure.

Matched die mold assembly, with male punch die of RTV-630, is subjected to 5000 psi at 350°F during reinforced plastic thermoforming.



RTV-630 embossing rolls provide high-fidelity detail on vinyl film. New ultra-high strength RTV is basis for savings in time and expense in making this production tool.



SILICONES

FOR PLASTICS PROCESSING

THREE RTV COMPOUNDS TO MEET VARYING PRODUCTION AND PERFORMANCE REQUIREMENTS

The product features described in this data book can be the basis for new applications of RTV grade silicones. Specific examples include use as punch dies for forming polyester premixes that have been impregnated into glass cloth, for intricate production casting of vinyl plastisols, and for extended production runs with epoxy casting resins.

Applications, however, are not restricted to tooling areas. Potential uses for RTV-630 and RTV-632 are in pressure cast functional parts, gaskets, encapsulants and high temperature sealants.

PRODUCT DESCRIPTION

RTV-630 Medium viscosity liquid that cures at room temperature with the addition of a curing agent to form a high tear resistant RTV. RTV-630 develops physical properties similar to standard heat cured silicone rubber while maintaining RTV processing characteristics.

RTV-632 Intermediate viscosity grade made from a blend of 60 parts RTV-630 and 40 parts RTV-634. The RTV-632 offers intermediate economy, handling and physical property profile.

RTV-634 Low viscosity compound primarily suggested for short run model duplication where exceptional physical properties are not required and economy is an important consideration. May be blended with RTV-630.

GENERAL PROPERTIES

Typical Uncured Properties				Typical Cured Properties				
	RTV-630	RTV-632	RTV-634		RTV-630	RTV-630	RTV-632	RTV-634
Specific Gravity	1.28	1.24	1.18	Compound/Catalyst Mix Ratio	10:1	20:1	10:1	10:1
Average Viscosity, cps	180,000	48,000	8,000	Tensile, psi	850	650	700	550
Color (Pastel)	Blue	Blue-green	Green	Elongation, %	300	400	180	220
Solids	100%	100%	100%	Tear, Lbs. (Die B)	100	100	50	20
Consistency	Pourable	Pourable	Easily Pourable	Durometer (Shore A)	70	55	55	35
Minimum Uncatalyzed Shelf Life	6 months	6 months	6 months	Linear Shrinkage, % (R. T.)	<.2	<.2	<.2	<.2
Working Time*	2 hours	2 hours	2 hours	Temperature Effect on Volume: Less than 1% per 10° C.				

*Working Time is time required for compound to double in viscosity.

Typical Electrical Properties	RTV-630, RTV-632, RTV-634
Dielectric Strength † — ASTM D-149	500 volts/mil
Dielectric Constant — ASTM D-150, 10 ³ cycles	3.4
Dissipation Factor — ASTM D-150, 10 ³ cycles	.001
Volume Resistivity — ASTM D-257	1 x 10 ¹⁴

†Tested on 0.064 inch thick specimen, using 1 inch electrode, in oil, 500 volt/sec. rise.



SILICONES

FOR PLASTICS PROCESSING

HOW TO USE THESE NEW RTV COMPOUNDS

MIXING PROCEDURE

In all cases the product line is composed of A and B portions. The normal mix ratio is 10 parts of A to one part of B. The only exception is with RTV-630 where it is possible to substitute a 15:1 or 20:1 (A:B) mix ratio. This change in mix ratio reduces durometer and produces higher elongation without affecting tear properties. It has been found that optimum mold casting life using epoxies occurs with the 20:1 mix ratio.

WORKING TIME

Upon blending A and B portions, a workable viscosity exists for a minimum of two hours at room temperature conditions (75°F). Blending at higher temperatures will decrease working time, depending upon the excess in mixing temperature.

DEAERATION

Immediately after mixing A and B portions, air must be removed to prevent bubbles and voids. A reduction pressure to 20 mm or below for 15 to 20 minutes is usually adequate. Please allow for a volume expansion of five times the quantity being deaerated. For best results, raise and lower pressure a number of times to break bubble formation.

In the production of molds, it may be possible to cure in a pressure chamber at 50 to 90 pounds line air pressure. Utilization of this technique eliminates the deaeration step and produces compact, bubble-free molds.

In applications where RTV-632 and RTV-634 are being molded around the prototype, the prototype surface should be painted with the RTV as a further deterrent to surface bubbles. RTV-630 possessing higher viscosity than RTV-632 and RTV-634 does not lend itself well to this application technique.

CURE CYCLES

Sufficient cure is realized in 48 hours at room temperature conditions to permit handling. An elevated temperature post cure is then recommended to quickly develop maximum physicals.

For production line use, the cure time can be substantially reduced by heating the compound.

Suggested cure times are:

- 65°C for 4 hours
- or 100°C for 1 hour
- or 150°C for 15-30 minutes

For heavy parts, the time required to bring the assembly up to curing temperature should be taken into account.

THICK SECTION CURE

At room temperature conditions, section thickness has no bearing on the 48-hour cure cycle. In applications where rapid elevated temperature cures are employed, oven residence time must be sufficient to heat through the silicone rubber.

VACUFORMING REINFORCED PARTS WITH RTV-630 MOLDS



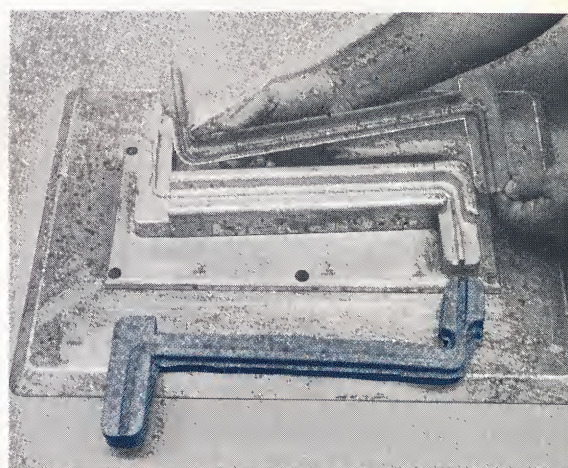
1. LAY-UP

Lay-up of fourteen glass-fiber reinforced phenolic strips is made in steel die . . .



2. THERMOFORMING

. . . RTV-630 mold is set in die over phenolic layup and total assembly is subjected to 500 psi and 350°F in autoclave . . .



3. FINISHED PRODUCT

. . . result is vacuformed laminated plastic structural part.

APPLICATION SUGGESTIONS

EXTENDING MOLD LIFE

Epoxy Casting Resins—Flexible molds and production tools made from RTV-630 are often required to withstand prolonged exposure to epoxy casting compounds. Amine catalysts used to crosslink the epoxy are gradually absorbed by the silicone rubber. Under continued exposure and absorption, a bond develops between the silicone and epoxy compound. When this condition exists, the silicone mold tears during removal of the cast epoxy part.

Two methods generally employed to extend mold life are (1) an occasional bake-out (8 hours at 300° F) to vaporize the amine contaminant and (2) dressing the mold surface prior to each casting with a dimethyl fluid, RTV-910.

In a third approach to prolonging mold life, dimethyl fluid (RTV-910) is added directly to RTV-630A. The effect of RTV-910 on handling characteristics and cured physicals of RTV-630 are summarized in the following table.

EFFECT OF RTV-910 ADDITION TO RTV-630*

Silicone Fluid Addition (RTV-910)	Viscosity cps	Tensile psi	Elong. %	Durometer (Shore A)	Tear (Die B)	Working Time (Hrs)
0 (Control)	175,000	850	300	60	108	3½
2%	148,000	790	265	55	95	5
5%	121,000	700	295	48	86	5½
10%	92,000	650	300	45	76	5½

*Cure: One hour at 212 F on ASTM test sheets.

All data is based on a 10:1 mix ratio of RTV-630A to RTV-630B. Silicone fluid additions are based on pph RTV-630A.

RTV-910 is primarily suggested for applications where the finished epoxy casting is not going to be painted at a later stage of manufacture. It has been found that even slight plate-out of RTV-910 on the epoxy casting is detrimental to adhesion of paint topcoats.

In some applications a 15:1 or 20:1 (A:B) mix ratio may be more desirable than a 10:1 mix ratio. Whenever possible, consider these operating parameters in developing an optimum system for the application.

Vinyl Plastisols—Conventional PVC plasticizers like amine catalysts are capable of being absorbed by the silicone rubber. Failure eventually occurs, due to the gradual decrease in the silicone physical properties, resulting in deterioration of the mold surface. Once again a bake-out is recommended (8 hours at 350° F) to minimize plasticizer effect.

CURE INHIBITION

RTV-630, RTV-632 and RTV-634 are compatible compounds utilizing the same type of catalyst system. Certain prototype materials such as butyl and chlorinated rubber, sulfur compounds, amines and metal soap cured RTV's are able to inhibit cure. Cure inhibition can best be described

as a surface condition whereby the silicone remains tacky to a depth of approximately five mils.

A worthwhile prevention is cleaning of metal or plastic masters with xylene or toluene if prior contact has been made with sources of inhibition.

PRIMER SS-4120

With the use of Primer SS-4120, RTV-630, RTV-632 and RTV-634 can be bonded to most substrates. The surface to be bonded must be clean and dry. If surfaces are resistant to solvent cleaning, a trichlorethylene wash is suggested. Surface roughening will improve the bond to metals.

The primer is applied by brushing, spraying or dipping. Film thickness should be between 0.1 and 0.3 mils, typical of that obtained with one dip, or a single brushing. Films greater than 0.5 mils in thickness show decreased bond strength.

The primer should be allowed to air dry for one hour before the compound is applied.

DILUENT RTV-910

The RTV-910 is a dimethyl silicone fluid which serves as a multi-purpose medium for the tool or model maker. It is used as a viscosity depressant and for extending mold life. Addition of up to 5% of RTV-910 will lower viscosity at some sacrifice in physical properties of the silicone rubber.

A secondary function of RTV-910 is for wipe-on-treatment of silicone rubber molds. Occasional surface application will improve release of epoxy cast parts. Frequency of use will depend on the intended purpose for which the epoxy part is being made. If a subsequent paint coat is planned, steps must be taken to solvent clean (xylene, trichlorethylene) the epoxy part to remove residual RTV-910 from the surface.

BARRIER COATS SS-4150 & SS-4101

Substrates posing a contamination threat can be brush coated with SS-4150 or SS-4101. The silicone is then normally given a room temperature cure. In certain instances it may be possible to utilize rapid elevated temperature cures, depending upon type of contamination.

STORAGE AND HANDLING

RTV-630 is made from a blend of RTV-630A compound and RTV-630B curing agent. Neither the A nor B portions are known to produce any toxic effect upon contact with the skin. These materials should be stored in clean, tightly closed containers in a cool, dry place.

The A and B portions can generate flammable gas on contact with acidic, basic or oxidizing materials, and such contact should be avoided.

Primer SS-4120 and barrier coat SS-4150 are supplied in solvent form. Solvents are flammable and poisonous. Keep these materials away from heat, sparks and open flame. Keep containers closed. Use only with adequate ventilation and avoid breathing of vapors.



SILICONES

FOR PLASTICS PROCESSING

A RANGE OF PRODUCTION AND FINISHED PRODUCT BENEFITS

TEAR STRENGTH UNEQUALLED BY OTHER RTV'S



With tear strength at 100 lb/in, die B, RTV-630 is more than twice as tough as existing liquid silicone rubber materials. In terms of plastics processing requirements, this outstanding strength means longer production life for RTV-630 molds or other production tools, with little or no material tearing or breakdown.

Shown here are two castings made from plastic structural parts. The darker casting, made of conventional RTV tore, broke in two pieces after a single flexing. The lighter casting—made of RTV-630—showed no sign of tearing or material fatigue even after 2500 flexings.

REVERSION RESISTANT UNDER EXTREME HEAT AND PRESSURE

Even under extreme heat and pressure, RTV-630 plastics production molds refuse to revert, tear or pit. Compare these two silicone rubber molds, developed for forming multi-layered, glass-reinforced structural parts under 500 psi pressure at 350° F. After 60 exposures, the conventional RTV mold had deteriorated to a soft, spongy material, prone to pitting and tearing with resultant defects in the finished part. Over the same period, the RTV-630 mold maintained its integrity, with no sign of reversion or other deleterious effects. Production life expectancy is estimated at least six times that of conventional RTV.



STRONGER, MORE DURABLE MOLDS WITH LESS RTV



With conventional RTV, molds for both intricate and simple parts were necessarily thick and bulky to ensure mold strength and durability. Result: more RTV required to make the mold and difficulties in extracting cast parts. Because RTV-630 is intrinsically strong, less material is needed to form the mold. Greater mold flexibility, fast, easy molded part ejection and extended mold life are major benefits of this new high strength, high endurance RTV silicone.

HIGH FIDELITY MOLDS WITH "BUILT IN" RELEASE

RTV's built-in release characteristic assures fast, clean extraction of the most fragile cast parts. Even the four-inch diameter, .030 inch thick ring shown here releases from its RTV mold quickly and easily. Similar delicate epoxy castings would be virtually impossible to remove from rigid type molds, even with an elaborate knockout pin system. Other flexible mold materials require parting agents, with breakage, mold tearing, and build-up problems.



CURED PROPERTIES EQUAL TO HEAT CURED RUBBER

RTV-630 is the first liquid silicone rubber with a physical property profile equal to that of heat cured silicone rubber stocks. In addition, its rapid cure, thick section cure and reversion resistance make this a material of unmatched performance capabilities.

This table, comparing the properties of RTV-630 with typical heat cure silicone stock and conventional RTV, serves to illustrate the outstanding potential of this new liquid silicone compound.

PHYSICAL PROFILE OF SILICONE RUBBERS

	RTV-630	Typical Heat Cured Silicone Rubbers	Typical RTV Rubber
Tensile, psi	850	1100	800
Elongation, %	300	400	130
Durometer-Hardness Shore A	70	70	60
Tear—die B, lb./in.	100	100	40

Inasmuch as General Electric Company has no control over the use to which others may put the material, it does not guarantee that the same results as those described herein will be obtained. Each user of the material should make his own tests to determine the material's suitability for his own particular use. Statements concerning possible or suggested uses of the materials described herein are not to be construed as constituting a license under any General Electric patent covering such use or as recommendations for use of such materials in the infringement of any patent.

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SILICONE PRODUCTS DEPARTMENT
WATERFORD, NEW YORK



SILICONES

SUPPLEMENTARY DATA

S-3C-1A

FILE WITH
DATA BOOK

S-3C

SILICONE RUBBER RTV COMPOUNDS for MIL-S-23586 (Wep)



LOW VISCOSITY
FOR POURING
AND POTTING



MODERATE VISCOSITY
FOR DIPPING AND
ENCAPSULATING



THIXOTROPIC
PASTE FOR SPREADING
AND SEALING

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SILICONE PRODUCTS DEPARTMENT
WATERFORD, NEW YORK



a complete line of RTV silicone rubber compounds designed to meet MIL-S-23586 (Wep)

SPECIFICATION INFORMATION MIL-S-23586 (Wep)

This military specification covers the requirements for room temperature vulcanizing (RTV) silicone rubber compounds most useful to aircraft and weapons applications. The specification describes the product and performance requirements of RTV silicone rubber compounds for electrical and mechanical applications as materials for potting, encapsulation, sealing and bonding.

PRODUCT SELECTION

General Electric offers a complete range of two-part RTV silicone rubber compounds designed to meet military specification MIL-S-23586 (Wep). Developed with the needs of the user in mind, these new materials make available to industry the broadest selection of

qualified RTV silicone rubber compounds specifically designed to meet this specification.

The RTV-8000 series materials listed below provide by product designation a kit containing the RTV compound with the proper amount and type of curing agent.

DESCRIPTION	PRODUCT	CURE
Low Viscosity	RTV-8111	Fast Cure— Reversion Resistant
	RTV-8112	Medium Cure
	RTV-8113	Slow Cure
Moderate Viscosity	RTV-8223	Slow Cure
	RTV-8243	Slow Cure
	RTV-8262	Medium Cure
	RTV-8263	Slow Cure
Thixotropic Paste	RTV-8372	Medium Cure
	RTV-8373	Slow Cure
	RTV-8382	Medium Cure
	RTV-8383	Slow Cure

Typical Properties—These General Electric two-part RTV compounds tested to MIL-S-23586 have been especially developed to provide the widest selection of viscosities, cure rates and handling properties to meet every application and processing requirement. The products are well suited for all types of industrial applications.

selector guide

This chart gives typical properties only and is not intended for use in preparing specifications. See certification table.

PRODUCTS DESCRIPTION RTV-8111 RTV-8112 RTV-8113 RTV-8223 RTV-8243 RTV-8262 RTV-8263 RTV-8372 RTV-8373 RTV-8382 RTV-8383

Viscosity	Low	Low	Low	Moderate	Moderate	Moderate	Moderate	Paste	Paste	Paste	Paste
Cure	Fast	Medium	Slow	Slow	Slow	Medium	Slow	Medium	Slow	Medium	Slow
MIL-S-23586 Classification											
Type	I	I	I	II	II	II	II	III	III	III	III
Class	1	2	3	3	3	2	3	2	3	2	3
Grade	B	A	A	A	A	A	A	A	A	A	A
Typical Uncured Properties											
Color	White	White	White	Pink	White	Red	Red	White	White	Red	Red
Consistency	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Thixotropic Paste	Thixotropic Paste	Thixotropic Paste	Thixotropic Paste
Viscosity, Poises	120	120	120	250	400	500	500	6000	6000	6000	6000
Non-Volatiles, %	98 Min.	98 Min.	98 Min.	98 Min.	98 Min.	98 Min.	98 Min.	98 Min.	98 Min.	98 Min.	98 Min.
Shelf Life, Months	6	6	6	6	6	6	6	6	6	6	6
Catalyzed Pot Life @ 77°F	15-45 Min	1-3 Hrs	3-7 Hrs	3-7 Hrs	3-7 Hrs	1-3 Hrs	3-7 Hrs	1-3 Hrs	3-7 Hrs	1-3 Hrs	3-7 Hrs
Curing Agent and Level, %	RTV-9891 3	RTV-9858 6	RTV-9858 3	RTV-9858 3	RTV-9858 3	RTV-9858 6	RTV-9858 3	RTV-9858 5	RTV-9858 3	RTV-9858 5	RTV-9858 3
Typical Cured Properties											
Specific Gravity	1.18	1.18	1.18	1.31	1.31	1.47	1.47	1.33	1.33	1.48	1.48
Hardness, Shore A	45	45	45	50	50	60	60	50	50	65	65
Tensile Strength, psi	350	350	350	550	500	800	800	500	500	750	750
Elongation, %	180	180	180	180	200	130	130	220	220	110	110
Linear Shrinkage, %	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Typical Electrical Properties											
Dielectric Strength, Volts/Mil	500	500	500	500	500	500	500	475	475	480	480
Dielectric Constant @ 10 ³ Cps	3.6	3.6	3.6	3.4	3.6	3.7	3.7	4.0	4.0	4.0	4.0
Dissipation Factor @ 10 ³ Cps	.019	.019	.019	.01	.01	.02	.02	.018	.018	.02	.02
Volume Resistivity, ohm-cm	6x10 ¹⁴	6x10 ¹⁴	6x10 ¹⁴	1x10 ¹⁴	1x10 ¹⁴	1x10 ¹⁴	1x10 ¹⁴	1x10 ¹⁵	1x10 ¹⁵	1x10 ¹⁴	1x10 ¹⁴

GENERAL APPLICATION AND HANDLING SUGGESTIONS

Mixing

Thoroughly mix the base compound with the specified type and amount of curing agent. Should air entrapment result deaeration is recommended for the liquid materials. When thoroughly mixed apply and allow to cure. Typical 24 hour cure time is sufficient for product handling. MIL-S-23586 specifies a 72 hour cure time prior to final product evaluation or testing.

Curing Agents

Curing agents RTV-9858 and RTV-9891 have as the active catalyst a liquid metal soap mixed with a suitable silicone base material and inert filler. The result is a curing agent with a pourable paste consistency.

Typical properties of curing agents

Characteristic	RTV-9858	RTV-9891
Color	Off-white — Beige	Light Blue
Consistency	Pourable paste	Pourable paste
Viscosity, Poises	200-600	200-800
Specific Gravity	1.58	1.75
Active Catalyst	Dibutyl Tin Dilaurate	Stannous Octoate

These curing agents contain organotin compounds as the active catalyst. Avoid prolonged skin contact which could result in skin irritation. In case of contact wash thoroughly with soap and water. In case of contact with the eyes, irrigate with water immediately and get medical attention.

Cure Rate and Pot Life

The pot life and cure rate of the 8000 series compounds shown in the property tables have been based on using the suggested amount of curing agent and a cure at room temperature. Adjustments may be made in the curing agent level to obtain slight variation in both pot life and cure rate. This involves increasing the curing agent level to speed the cure resulting in a corresponding reduction in pot life.

Pot life and cure rate can be changed by temperature also. Pot life may be extended by refrigerating the catalyzed compound. Cure rate in turn may be speeded up by curing at higher temperatures.

Bonding

All of the RTV compounds described in this data book can be bonded to most metals, plastics, glass, etc. by using a suitable primer. When properly applied, this will result in bonds stronger than the rubber itself.

Primers

For qualification to the adhesion requirements of MIL-S-23586 General Electric SS-4004 silicone primer was used. Other suitable primers are SS-4044 and SS-4101.

The bright, fluorescent pink color of SS-4004 makes it easy to determine whether a uniform coating has been applied. Fast drying solvents (acetone and isopropanol) in SS-4004 speed up its drying time, but these solvents are highly flammable and precautions must be taken to keep the primer away from fire or flame. The low flash point of SS-4004 prevents its being shipped by parcel post, except in sample quantities.

SS-4044 Clear Primer is a clear, colorless primer identical to SS-4004 except for the absence of the red color. The same solvents are employed and the same flammability precautions apply.

SS-4101 Primer is blue in color, available in handy aerosol cans for easy spray application as well as in bulk form for dipping or brushing.

Typical properties of RTV Silicone Primers

Property	SS-4004	SS-4044	SS-4101
Color	Fluorescent Pink	Clear	Blue
Solids, % (45 min. @ 150 C)	15-18	15-18	15-18
Specific Gravity (25/4 C)	0.84-0.86	0.84-0.86	0.92-0.96
Dry Time, hrs.	<1	<1	1 (approx.)

Bonding Procedure

All surfaces to be bonded should be thoroughly cleaned with a suitable solvent such as toluene, xylene, etc. Roughing up the surface with emery paper or sandblasting is not necessary.

SS-4004 or SS-4044 Primers are best applied by brushing or dipping. SS-4101 Primer may be brushed, dipped or sprayed — the spraying may be done by any convenient method, including the handy available aerosol cans. A uniform primer coat of approximately 0.5 to 1 mil in thickness usually provides the strongest bonds. When SS-4004 is used, the surface should be uniformly colored a light pink — *a dark red-pink color indicates too much primer; a light, almost colorless pink may indicate incomplete coverage.* The proper primer thickness, as indicated by color of the applied SS-4004 or SS-4101 Primers, which will give the highest bond strength in a given application can easily be determined by trial and can then be reproduced in subsequent production operations.

Allow the primer to air dry for at least a half hour (an hour is better) before the RTV is applied. On porous surfaces a second coat of primer may be required; allow at least an hour drying time between coats.

Apply the RTV compound by laying it in place on the primed surface without severe rubbing which might disrupt the primer coating.

Bonding to cured silicone rubber surfaces (RTV or heat cured) generally does not require the use of a primer.

(Continued on Back Cover)

a new addition to G.E.'s line of proven RTV compounds

GENERAL PRODUCT INFORMATION

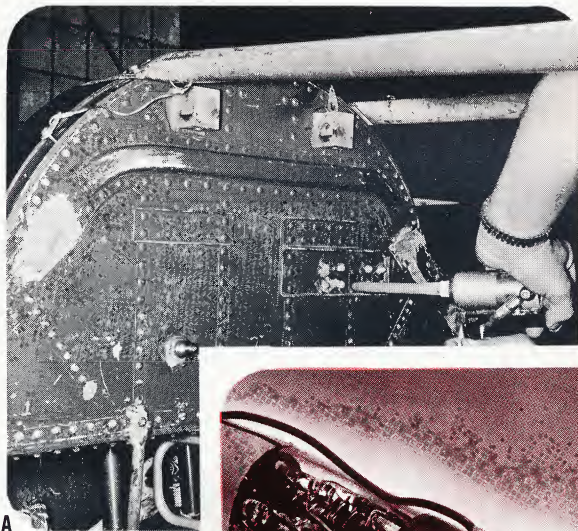
Only one elastomeric material has proved to be virtually immune to ozone, ultraviolet light, severe temperature change and oxidation through years of rough service. That material is silicone rubber. Originally developed by General Electric Research Laboratories silicone rubber has solved many design and engineering problems in both industrial and aerospace applications. The RTV-8000 series materials are a new addition to this line of proven RTV silicone rubber compounds. They were designed specifically to meet the performance and reliability standards established by MIL-S-23586 (Wep) and as other GE RTV Silicone Rubber Compounds, these new products provide:

- **RESISTANCE TO TEMPERATURE EXTREMES** — Retains elastomeric properties from -90°F to $+600^{\circ}\text{F}$ temperature range.
- **GOOD PHYSICAL AND ELECTRICAL PROPERTIES** — Physical toughness and insulating ability are maintained over a wide range of operating temperatures.

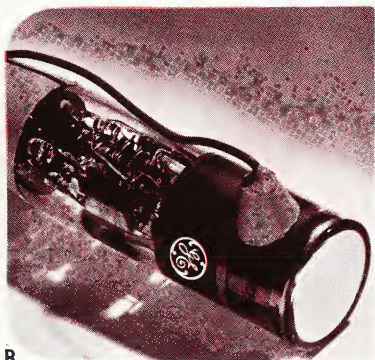
- **RESISTS OZONE, WEATHERING AND AGING** — RTV silicone rubber resists the effects of aging and environmental conditions that break down ordinary elastomers.
- **CHEMICAL RESISTANCE** — RTV resists attack from many common oils, solvents and chemicals.
- **GOOD BONDING ABILITY** — Adhesion to properly primed surfaces is stronger than the rubber itself.

In addition the RTV-8000 series specifically provides:

- **EASY TO MIX CATALYST TO COMPOUND RATIOS** — Convenient kit containing proper catalyst simplifies mixing.
- **PREVENTS COPPER CORROSION** — This system provides inhibition to copper corrosion, most important in electronic applications.
- **REVERSION RESISTANT CHARACTERISTICS** — RTV-8111 cures in deep sections and conforms to the reversion resistant requirements of MIL-S-23586 (Wep).



A



B



C

available in a range of viscosities for a variety of applications

A The thixotropic compounds which flow easily under pressure — yet do not sag or flow in place — were developed specifically for meeting stringent sealing and caulking requirements.

B RTV compounds are 100% solids and thus do not shrink significantly on curing. When using moderate viscosity compounds for encapsulation, voids and stress on components are eliminated. Silicone rubber won't transmit shock and vibration as inflexible encapsulants do.

C Low viscosity RTV compounds are used to pot electrical components to provide environmental protection and reliable performance under adverse operating conditions. RTV compounds cure at room temperature without generating heat.

GENERAL APPLICATION AND HANDLING SUGGESTIONS (con't.)

Ordering Instructions

Specify quantity, container and product designation. When the product designation is given the proper amount and type of curing agent is automatically provided. Orders should be sent directly to General Electric Company, Silicone Products Department, Waterford, New York, or to the Silicone Products Department sales office nearest you.

Storage and Handling

All RTV compounds should be kept during storage in clean, covered containers at the lowest possible temperature (not above 80°F for extended periods).

The shelf life of RTV compounds will be in excess of the times indicated in the property table. Each package of General Electric RTV compound is stamped with a warranty expiration date and it is advisable to use the material before this date, although the useful shelf life should be somewhat longer. If material is used considerably later than the expiration date, it is advisable to test a small quantity to be sure that a proper cure can still be obtained. All curing agents exhibit shelf life equivalent to their respective products.

RTV compounds are non-toxic and completely safe to handle. However, care should be taken in handling curing agents and primers as covered above.

General Electric certification

General Electric Specification Limits

General Electric RTV products in the RTV-8000 series are designed to meet the requirements of military specification MIL-S-23586 (Wep). The products conform to acceptance test requirements of this specification as shown below.

PRODUCT RTV-8111 RTV-8112 RTV-8113 RTV-8223 RTV-8243 RTV-8262 RTV-8263 RTV-8372 RTV-8373 RTV-8382 RTV-8383

MIL-S-23586 (Wep) Acceptance Test Properties											
Viscosity, Poises	50- 200	50- 200	50- 200	200- 800	200- 800	200- 800	200- 800	5000- 20,000	5000- 20,000	5000- 20,000	5000- 20,000
Pot Life	15-45 Minutes	1-3 Hours	3-7 Hours	3-7 Hours	3-7 Hours	1-3 Hours	3-7 Hours	1-3 Hours	3-7 Hours	1-3 Hours	3-7 Hours
Hardness, Shore A, Min.	40	40	40	45	45	45	45	45	45	45	45
Tensile Strength, psi, Min.	250	250	250	350	350	350	350	400	400	400	400
Elongation, %, Min.	100	100	100	100	100	100	100	100	100	100	100
Dielectric Strength, Volts/Mil Min.	400	400	400	400	400	400	400	400	400	400	400

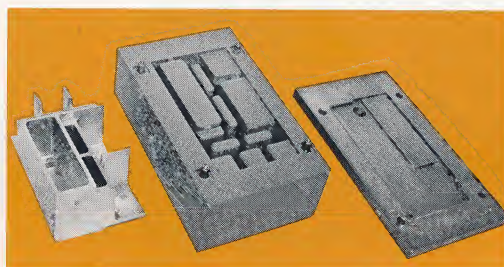
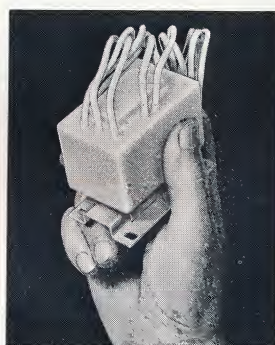
Inasmuch as General Electric Company has no control over the use to which others may put the material, it does not guarantee that the same results as those described herein will be obtained. Each user of the material should make his own tests to determine the material's suitability for his own particular use. Statements concerning possible or suggested uses of the materials described herein are not to be construed as constituting a license under any General Electric patent covering such use or as recommendations for use of such materials in the infringement of any patent.



RTV

SILICONE

RUBBER



SILICONE PRODUCTS DEPARTMENT

GENERAL  **ELECTRIC**

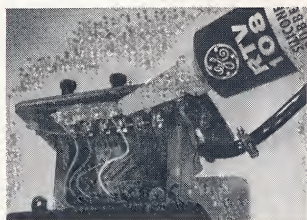
WATERFORD, NEW YORK



RTV

SILICONE RUBBER

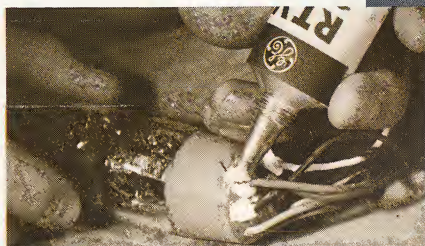
a broad range of compounds to meet a variety of application requirements



RTV provides instant, see-through insulation as well as vibration resistance and environmental protection. Applied directly from the tube, it needs no pre-mixing.

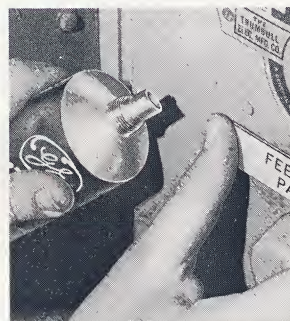


RTV comes in several viscosities, permitting pouring or painting around the original part. Its flexibility permits one-piece molding of complicated parts and easy removal without knock-out pins.



RTV adhesive/sealant, straight from the tube, can be used for insulating open wiring, for on-the-spot caulking, gluing and soldering. Virtually ageless, it will not stress-crack or weather.

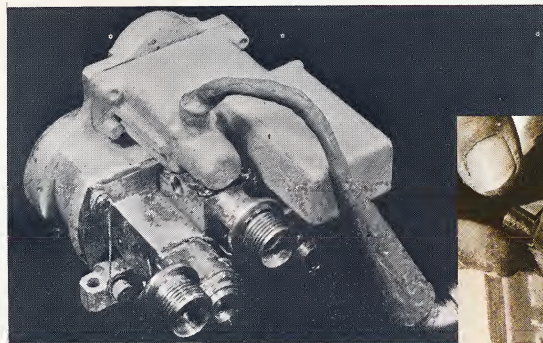
RTV speeds potting rates, cures to a clear, resilient compound in 15 minutes at 150°C. It protects assemblies against thermal shock, vibration, moisture, ozone, corona, dust and chemicals.



RTV eliminates need for screws and drilling when used to affix name plates and decorative emblems on any surface.



RTV combines low viscosity with high strength for filling small and complicated configurations. Excellent physical strength makes it a superior mold material for prototypes and short-run production.



RTV silicone rubber coating protects mechanical assemblies, like this three position activator, against moisture and chemicals. RTV is used on almost all U.S. missiles and space vehicles for sealing, electronic potting and encapsulating, thermal insulation.



RTV, transparent or opaque, provides resilient protection against moisture, ozone, thermal and mechanical shock. It flows freely around complicated parts, can be cut away to replace internal components.



RTV penetrates deep into transformer coils. As an encapsulating material, it provides excellent dielectric strength with practically no shrinkage. Cure time at room temperatures can be varied from minutes to hours.

these properties of G-E RTV Silicone Rubber make possible improved product performance, lower costs, simplified production methods

General Electric RTV (room temperature vulcanizing) silicone rubber compounds are liquids or pastes that cure to strong, durable, resilient silicone rubber. Most RTV compounds require the addition of a catalyst to initiate this cure. However a new RTV adhesive/sealant is available in ready-to-use form which starts to

cure as soon as it comes in contact with the air. Cure times of the two-package RTV's can be varied from 10 minutes to 24 hours depending on the type and quantity of catalyst used. A wide range of viscosities and properties meet a variety of application requirements.

■ RESISTANCE TO TEMPERATURE EXTREMES

Retains elastomeric properties over -190°F to 600°F temperature range. As a thermal barrier or ablative coating, useful up to 9000°F .

■ GOOD PHYSICAL AND ELECTRICAL PROPERTIES

Physical toughness and insulating ability are retained over a wide range of operating temperatures.

■ RESISTS OZONE, WEATHERING AND AGING

RTV silicone rubber stands up for long periods of time under conditions that break down ordinary elastomers.

■ CHEMICAL RESISTANCE

RTV resists attack from many common oils, solvents and chemicals.

■ GOOD BONDING ABILITY

Bonds to *properly primed surfaces* are stronger than the rubber itself. Ready-to-use RTV adhesives do not require a primer.

■ EASY RELEASE

RTV silicone rubber has the inherent ability of silicones to release from sticking — ideal for molds or release coatings.

■ AVAILABLE IN WIDE RANGE OF VISCOSITIES

From 12 to 12,000 poises (1200 to 1,200,000 centipoises)

■ CONTROLLABLE CURE TIMES

Cures at room temperature. Cure time can be varied from 10 minutes to 24 hours by curing agent selection.

■ MINIMUM SHRINKAGE

Shrinkage as low as 0.2%. RTV compounds are 100% solids, contain no solvents.

■ THICK SECTION CURE

RTV can easily be cured in thick sections.

■ RESILIENCE, ELASTICITY

RTV silicone rubber is a true elastomer, not a flexible plastic. It absorbs shock and vibration, retains elastomeric properties at extreme temperatures.

■ APPLICATION VERSATILITY

RTV compounds, available in viscosities from a pourable liquid to a thick paste, can be applied to objects of virtually any size and shape. Easy mixing and curing of RTV makes it an ideal "do-it-yourself" material for many applications.

■ FOR HIGH TEMPERATURE SEALING AND CAULKING

No other sealant can match RTV for extreme temperature performance, durability, flexibility and ease of application. Wherever they are used, these tough, flexible sealants bond to materials with a strength exceeding that of the rubber itself. Latest development is a sealant requiring neither curing agent nor primer to make application even easier.

■ FOR ELECTRICAL POTTING AND ENCAPSULATING

RTV's wide usage as electrical insulation is based on its good electrical properties coupled with its resistance to ozones and temperature extremes. It is used for potting electronic components and assemblies, for impregnating and encapsulating aircraft transformers, for encapsulating random-wound electrical motors and dozens of other uses.

■ FOR AEROSPACE APPLICATIONS

RTV methyl-phenyl compounds have been formulated to meet extreme temperature requirements in many aerospace applications. They maintain flexibility at -150°F and below, yet provide long-term resistance to extreme high temperatures. These RTV's are used for electrical and mechanical insulation, and heat shield fabrication.

■ FOR FLEXIBLE MOLD FABRICATION

RTV is finding increasing usage as a flexible mold material because it offers the most precise reproduction of surface detail possible. Because it can replace expensive metal or hand-machined molds, it is the basis for substantial savings in such applications. Moreover, no release agent is required for RTV molds used in casting epoxy and polyester.



RTV

SILICONE

RUBBER

selector guide

(Requires No Curing Agent)

READY-TO-USE RTV

ADHESIVES/SEALANTS

	-102	-103	-106	-108	-109	-112	
MAJOR USES							
Sealing	X	X	X	X	X	X	
Potting, Encapsulating						X	
Flexible Mold Material							
Aerospace (Extreme Temperature)	X		X				
TYPICAL UNCURED PROPERTIES							
Color	White	Black	Red	Trans.	Alum.	White	
Consistency	Soft, Spreadable Thixotropic Paste					Liquid	
Viscosity, Poises	—	—	—	—	—	300	
Shelf Life (Months)	12	12	12	12	12	12	
TYPICAL CURED PROPERTIES							
Specific Gravity	1.07	1.07	1.07	1.07	1.07	1.05	
Hardness, Shore A Durometer	30	30	33	30	30	30	
Tensile Strength, psi	350	350	350	350	350	300	
Elongation, %	400	400	400	400	400	350	
Tear Resistance, die B, lb/in	45	45	50	45	45	25	
Brittle Point, °F	Below -90°F	Below -90°F	Below -90°F	Below -90°F	Below -90°F	Below -90°F	
Linear Shrinkage, %	1.0	1.0	<0.5	1.0	1.0	1.0	
HEAT RESISTANCE							
Thermal Conductivity BTU-ft/hr ft ² °F @ 200°F	0.12	0.12	0.12	0.12	0.12	0.12	
Coefficient of Thermal Expansion in/in °F (0°-350°F)	< 15x10 ⁻⁵	< 15x10 ⁻⁵	< 15x10 ⁻⁵	< 15x10 ⁻⁵	< 15x10 ⁻⁵	< 15x10 ⁻⁵	
TYPICAL ELECTRICAL PROPERTIES							
Dielectric Strength, volts/mil 0.075" thick	500	500	500	500	500	500	
Dielectric Constant @ 60 cps	2.8	2.8	2.8	2.8	2.8	2.8	
Dissipation Factor @ 60 cps	.0026	.0026	.0026	.0026	.0026	.0004	
Volume Resistivity, OHM-cm	3x10 ¹⁵	3x10 ¹⁵	3x10 ¹⁵	3x10 ¹⁵	3x10 ¹⁵	2x10 ¹⁵	

HEAT RESISTANCE

Where retention of elastomeric properties is essential:

Short Time — Up to 600F (red compounds)

Short Time — Up to 500F (white, black and transparent compounds)

Continuous — Up to 500F (red compounds)

Continuous — Up to 400F (white, black and transparent compounds)

The following information is intended as a guide only and has been designed to help select those RTV compounds most desirable for your particular application. All properties are typical and should not be used in preparing specifications. For assistance and recommendations in the preparation of specifications, contact General Electric Silicone Products Department, Waterford, N. Y.

2 - PACKAGE RTV COMPOUNDS (Requires Curing Agent)

	METHYL – PHENYL RTV COMPOUNDS				DIMETHYL RTV COMPOUNDS												
	-511	-560	-577	-580	-602	-615	-616	-11	-20	-21	-30	-40	-41	-60	-77	-88	-90
	X	X									X			X			
	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X
								X		X	X		X	X			
	X	X	X	X		X	X				X			X		X	X
	White	Red	White	Red	Clear	Clear	Black	White	Pink	Pink	Red	White	White	Red	White	Red	Red
	Easily Pourable	Pourable	Spreadable Thixotropic Paste		Easily Pourable				Pourable	Pourable	Pourable	Pourable	Pourable	Pourable	Spreadable Thixotropic Paste		Stiff Paste
	200	400	6000	8000	12	30	40	120	250	250	250	400	400	500	6000	6000	12,000
	6	4	4	3	6	6	6	6	3	6	4	3	6	4	4	3	6
	1.18	1.42	1.35	1.49	0.99	1.02	1.22	1.18	1.35	1.31	1.45	1.35	1.31	1.47	1.33	1.48	1.50
	45	60	50	65	15	35	45	45	50	50	60	55	50	60	50	65	60
	350	800	480	800	—	925	925	350	450	550	850	550	500	800	500	750	750
	180	160	180	110	—	150	125	180	140	180	130	120	200	130	220	110	150
	25	45	25	40	—	25	25	15	25	30	40	25	30	40	25	40	75
	Below –150°F	Below –150°F	Below –150°F	Below –150°F	Below –90°F	Below –90°F	Below –90°F	Below –90°F	Below –90°F	Below –90°F	Below –90°F	Below –90°F	Below –90°F	Below –90°F	Below –90°F	Below –90°F	Below –90°F
	.2-6	.2-6	.2-6	.2-6	<.2	<.2	<.2	.2-6	.2-6	.2-6	.2-6	.2-6	.2-6	.2-6	.2-6	.2-6	.2-6
	0.15	0.18	0.18	0.18	0.10	0.11	0.16	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
	12x10 ⁻⁵	11.4x10 ⁻⁵	11.4x10 ⁻⁵	11.4x10 ⁻⁵	16.2x10 ⁻⁵	15.3x10 ⁻⁵	15x10 ⁻⁵	14.1x10 ⁻⁵	11.4x10 ⁻⁵	11.4x10 ⁻⁵	11.4x10 ⁻⁵	11.4x10 ⁻⁵	11.4x10 ⁻⁵	11.4x10 ⁻⁵	11.4x10 ⁻⁵	11.4x10 ⁻⁵	11.4x10 ⁻⁵
	550	550	485	470	500	500	500	500	500	500	475	500	500	500	475	450	500
	4.1	4.4	4.1	4.1	3.0	3.0	3.0	3.6	3.6	3.4	4.0	4.2	3.8	3.7	4.0	4.0	4.0
	.005	.006	.006	.006	.001	.001	.001	.019	.011	.01	.025	.02	.14	.020	.018	.023	.020
	1x10 ¹⁵	1x10 ¹⁵	1x10 ¹⁵	1x10 ¹⁵	1x10 ¹⁴	1x10 ¹⁵	1x10 ¹⁵	6x10 ¹⁴	5x10 ¹³	8.8x10 ¹⁴	2.9x10 ¹⁵	1x10 ¹⁴	1.5x10 ¹⁴	1.3x10 ¹⁴	1x10 ¹⁵	1x10 ¹⁴	1.3x10 ¹⁴

Elastomeric properties not essential:

Integrity of material and electrical insulating ability retained for extended periods at 600F and above

Thermal Insulation:

Short time — up to 9000F.



adhesives and sealants

RTV silicone rubber compounds have found wide use as adhesives, sealants and caulking materials. Recently introduced ready-to-use RTV's are specifically designed for these applications. They are packaged in convenient aluminum tubes or plastic cartridges, in white, red, black, transparent and aluminum compounds. They cure without addition of a curing agent and form strong bonds to most materials.

Because of its easy application, fast cure, and excellent bonding ability, RTV is an ideal adhesive/sealant for an unlimited number of industrial applications, ranging from production work to fast, effective maintenance and on-the-spot repairs.

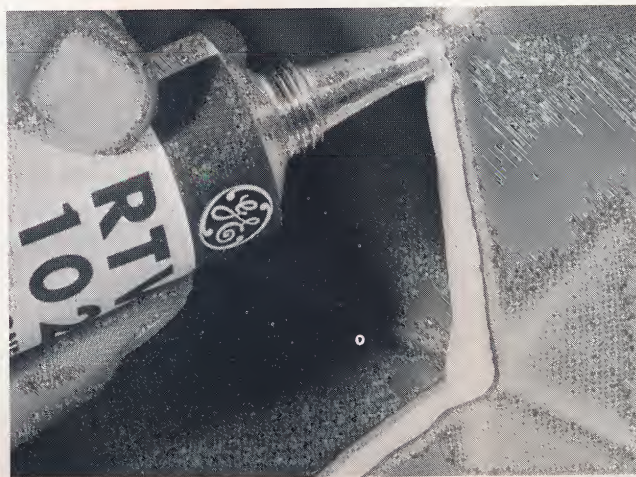
Typical applications include use in potting electrical terminal connections, for sealing and encapsulating electronic equipment, for bonding strain gages, patching and repairing silicone rubber fabricated parts, bonding silicone rubber gaskets to metal surfaces, and for virtually all applications requiring a flexible and durable adhesive bond.

All of the two-package RTV compounds may also be used as sealants provided a suitable primer is used.

RTV sealants have been used extensively on the most advanced jet liners and on almost every U.S. missile and space vehicle. No other sealant can match their extreme temperature performance, durability, flexibility and ease of application. These tough, flexible sealants can be bonded to most materials with a bond strength exceeding the strength of the rubber itself.

PRODUCT SUGGESTIONS

Ready-to-use RTV's, which require no curing agent or primer, are recommended for most general purpose applications. Of this group, RTV-106 is recommended for high temperature application (to 600°F). With the exception



EASILY APPLIED, ready-to-use adhesive/sealant won't sag or flow, even on vertical and overhead surfaces.

of RTV-112, which is a low-viscosity pourable liquid, all ready-to-use RTV's are spreadable paste compounds.

Two-package RTV sealants require that surfaces be primed before application. RTV-88 and RTV-90, moderate viscosity paste compounds, are recommended for extreme high temperature applications. RTV-60 is useful in applications where the sealant is permitted to flow into place.

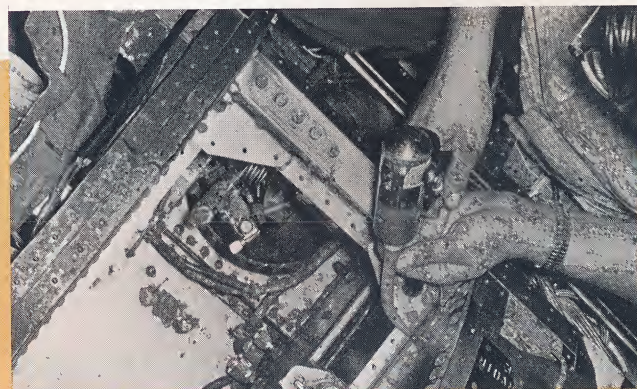
APPLICATION SUGGESTIONS

To obtain good bonds, the bonding surface should be thoroughly cleaned. Ready-to-use RTV's can be applied direct from tube or cartridge. Automatic dispensing equipment is available for applying all RTV silicone sealants.

For more detailed information, refer to Technical Data Books S-2 and S-3.



A tight seal is assured by applying RTV adhesive as a self-forming gasket.



X-15 rocket plane has critical pressurized areas sealed with G-E RTV silicone rubber.



SILICONES for potting and encapsulating

The good electrical properties of RTV silicone rubber, along with its resistance to ozone and temperature extremes, have led to its wide use as electrical insulation. It has been used for potting electronic components and assemblies, for impregnating and encapsulating aircraft transformers, for encapsulating random-wound electric motors and for dozens of other electrical applications.

RTV compounds have several advantages over most other potting and encapsulating materials. They cure at room temperature and do not generate heat while curing. Heat sensitive components can therefore be safely encapsulated in RTV silicone rubber.

Since RTV compounds are 100% non-volatile, they do not shrink significantly on curing and therefore do not form voids or place any stress on encapsulated components. They are available in low viscosities which permit coil impregnation as well as encapsulation. Resilient RTV silicone rubber provides extra physical protection since it does not transmit shock and vibration as inflexible encapsulants do.

All of these compounds permit easy repair of encapsulated assemblies simply by cutting away a portion of the cured material. RTV-602, a clear potting compound which cures at low temperatures, is most easily repaired and, being transparent, permits visual inspection of potted assemblies.

PRODUCT SUGGESTIONS

All of the compounds described in this bulletin have excellent electrical properties and may be used for potting and encapsulating.

Clear RTV-602, a low viscosity compound, should be used where visual inspection and easy repair are important. It provides excellent protection against thermal and mechanical shock. RTV-615, another clear potting compound, has improved properties over previously available clear compounds. In addition, it is a faster curing system, suitable for production line use. Also available is a black silicone compound which exhibits similar performance characteristics.



Different potting and encapsulating problems require different solutions. General Electric offers a complete range of RTV silicones. RTV-602 is transparent, resilient and easy to repair. RTV liquid silicone rubber compounds offer good physical strength, resiliency and a selection of viscosities for impregnation, potting, conformal coatings or sealing.

RTV-11 is most widely used because of the combination of low viscosity and good physical properties. Where better physical strength is required, RTV-30 or RTV-60 are used. RTV-60 is one compound recommended for random-wound motor encapsulation.

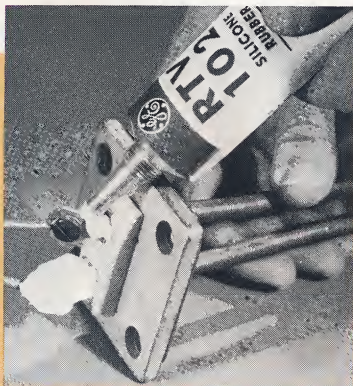
Ready-to-use, single-package RTV compounds find many potting and sealing applications, particularly in electrical repair work.

APPLICATION SUGGESTIONS

In electronic potting, it is usually advisable to deaerate the material to remove any air bubbles that might be trapped and cause voids. Deaerating the potted equipment during the potting operation is also a wise precaution.

Priming of components before potting is recommended for optimum electrical properties.

For more complete instructions, ask for Technical Data Book S-3.



Instant insulation can be obtained by applying RTV-102 to virtually any type of exposed electrical connections. RTV-102 is ready-to-use, requires no catalyst. Handy on production lines or in an electrician's tool kit.



Usually applied by pouring or dipping, silicone compounds may also be sprayed, brushed or applied by pressure guns or automatic equipment.



Random-wound motors encapsulated with RTV are being used in applications where totally enclosed motors were previously used. This extra protection is available in new motors or can be added when motors are re-wound.

SILICONES for high and low temperature aerospace applications

Specially formulated to meet the extreme conditions which characterize aerospace environments is a new group of methyl-phenyl base RTV compounds. These new RTV silicone rubber materials have elongations up to 200% even at temperatures of -150°F and below. At the same time, they provide long-term resistance to high temperatures, thus affording extended usage as thermal insulation.

Like all available RTV compounds, these new materials cure at room temperature, after the addition of a curing agent, to form a durable and resilient protective silicone rubber. Available in the form of pourable liquids or thixotropic pastes, these compounds are used wherever extreme performance is required, including a wide range of electrical and mechanical insulation applications on apparatus operating in environments approaching cryogenic temperatures. In addition, they are used as thermal insulation for firewall sealants and in heat shield fabrication in ablative applications.

PRODUCT SUGGESTIONS

RTV methyl phenyl-base compounds differ primarily in viscosity, ranging from pourable compounds to heavy, thixotropic pastes. They are used for sealing, caulking and insulating where maintained low-temperature flexibility is important, as well as for high-temperature-resistant coatings and shields.

RTV-511 is a white, easily pourable compound for potting and encapsulating where extreme low temperature flexibility is needed. RTV-560, a red, moderate-viscosity compound, provides the best thermal stability of any pourable RTV compound.

For sealing, patching and caulking, RTV-577 and RTV-580, spreadable pastes, are recommended.



New RTV compounds maintain flexibility in temperatures to -150°F and below.

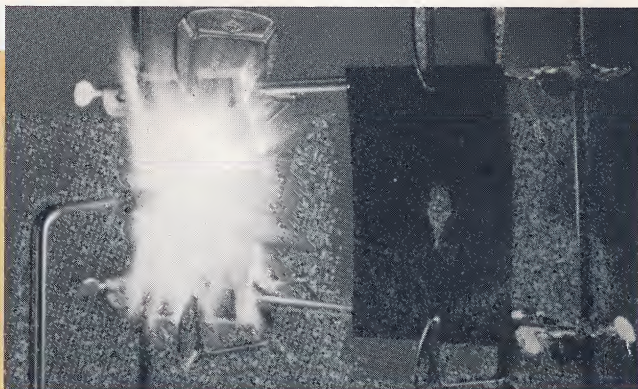
APPLICATION SUGGESTIONS

Like the standard, two package RTV's, methyl-phenyl RTV's are cured by the addition of a curing agent. Mixing, priming and curing technique are described in Technical Data Book S-3.

These new RTV compounds can be bonded to most metals, plastics, glass, etc. by using a suitable primer. When properly applied, bonds stronger than the rubber itself will result.



The Mercury spacecraft is completely sealed with heat-resistant RTV.



New methyl-phenyl compounds exhibit excellent resistance to flame. For example, RTV-511 and -560 do not propagate flame when subjected to repeated 15 second exposures to a 2000°F flame test.



RTV

SILICONE RUBBER as a flexible mold material

No other flexible mold material offers the precise reproduction of surface detail possible with RTV silicone rubber. RTV molds are being used in many applications which formerly required expensive metal molds or for making duplicates which were previously hand machined in order to obtain the desired accuracy. In these cases, the use of RTV silicone rubber has made possible very substantial savings.

Because of its natural release ability, an RTV mold easily releases parts cast in epoxy resins *without a release agent*. Since RTV cures with extremely little shrinkage, the mold configuration will be identical with the original. Its flexibility permits the reproduction of complicated shapes and undercuts. All of these factors provide a combination of quality and economy previously unavailable with any mold material.

RTV molds are frequently used for low-cost plastic tooling, for reproducing models and prototype parts, for short production runs of plastic parts, and for making replacements for broken parts by using the broken parts as a master. RTV molds are also finding increased use by hobbyists, jewelry manufacturers and museums. It makes possible the precise reproduction of art objects and artifacts.

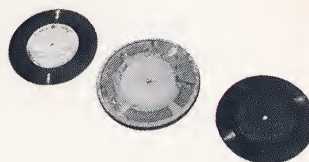
PRODUCT SUGGESTIONS

RTV-11, because of its low viscosity, is useful in reproducing extremely fine detail. However, physical properties are relatively poor.

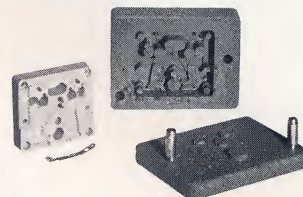
RTV-30, with somewhat higher viscosity, offers much better physical properties and will permit a fairly high number of reproductions from one mold.

RTV-60 has been widely used because of its good physical properties.

RTV-88 is often used for molding objects with large vertical surfaces. It can be spread over the object to form a thin mold which can be backed up with a less expensive material. Details of this process are available on request.



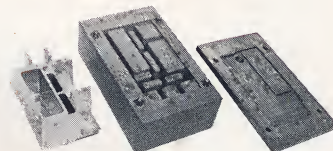
Epoxy reproduction of master record has good fidelity, proving that microgrooves were reproduced precisely by the RTV mold.



Fixtures previously machined from laminated plastic are cast in a two-part RTV mold — at a saving of over \$150 on each fixture.

Hobbyists and jewelry manufacturers are finding many uses for flexible RTV molds.

Complex designs, undercuts, etc., present no problems with RTV molds.



The other RTV compounds are also useful as mold materials. User selects viscosity based on his particular requirements.

APPLICATION SUGGESTIONS

Making flexible molds with RTV is easy when you follow the simple steps illustrated on this page.

For extremely high-quality reproduction, both the mold and the reproduction may be cured in a pressure tank under 50 to 95 pounds air pressure. A low-cost paint pressure tank is adequate.

For more complete instructions, ask for bulletin CDS-191.

THREE EASY STEPS TO MAKE AN RTV MOLD



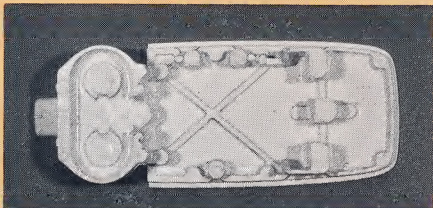
1. Mix RTV and curing agent. Avoid air entrapment and bubbles. Vacuum treatment in a deaerator will assure complete air removal.



2. Paint RTV on master pattern to assure complete coverage and penetration into fine details. RTV-60 aerosol may be used.

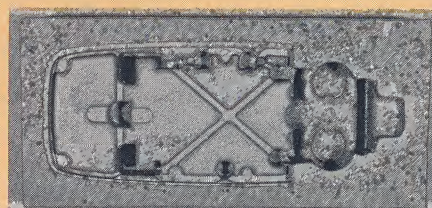


3. Pour remainder of RTV over pattern. RTV can be retained with wooden blocks or a cardboard box.



result

A flexible mold that will provide precise plastic reproductions of the master pattern.





An ordinary plastic bottle makes a handy applicator for catalyzed RTV.

tips on using

NOTE: The following items are intended to provide a general guide to the use of RTV products and to demonstrate their application versatility. For full information, the bulletins listed on the back cover are recommended.



CURING AGENTS AND CURE RATES

Dibutyl tin dilaurate (Thermolite-12*) is the curing agent recommended for two-package RTV in most applications. Used in concentrations of 0.1 to 0.5 percent by weight, it cures at moderate speeds. Higher catalyst concentrations result in faster cure rates. Tin octoate (Nuocure 28*) is used when cure time of 30 minutes or less are required. Faster cures naturally result in less working time or pot life (time between compound mixing and cessation of flow). The chart below provides an easy guide for measuring curing agents for most applications.

Cure rates can be accelerated by increasing temperatures or retarded by lower temperatures. If desired, cured RTV can be stored below 0°F for several days, then oven cured in less than one hour.

RTV-602 clear potting compound is cured with curing agent SRC-04 (cures at moderate speeds) or SRC-05 (fast cure). Room temperature cures in less than 24 hours are possible, although moderate temperatures of 150°-175°F are frequently used to accelerate cure rates.

ELIMINATING AIR BUBBLES AND VOIDS

Air may be entrapped during mixing or application, which will cause voids in the cured rubber. Vacuum treatment in a deaerator will help eliminate this problem. For 150

grams of compound, 15 minutes under vacuum of 5-10 mm Hg is usually sufficient.

KEEPING SHRINKAGE TO A MINIMUM

Linear shrinkage of 0.2 to 0.6% during cure can be expected due to loss of volatiles (catalyst and cure-reaction by-products). Curing at elevated temperatures may increase shrinkage. For minimum shrinkage, cure with minimum curing agent at room temperature.

BONDING

For bonding RTV compounds (except RTV-102), the bonding surface should be primed with G-E SS-4004 (pink) or SS-4044 (clear) primer. Porous surfaces may require two coats. Primers should be applied to clean surfaces and allowed to air dry for at least one hour.

The ready-to-use RTV adhesive-sealants bond to most clean surfaces without a primer.

LOWERING VISCOSITY WITH RTV DILUENTS

Viscosity of RTV compounds can be lowered by the addition of RTV-910 or RTV-911 diluents. The use of these diluents will affect cured physical properties somewhat but does not affect electrical properties.

MEASURING GUIDE To Obtain These Curing Agent Concentrations

WEIGHT OF RTV		0.1% Dibutyl Tin Dilaurate (Pot life 2-6 hrs.)		0.5% Dibutyl Tin Dilaurate (Pot life 1-2 hrs.)		1% Tin Octoate (Pot life less than 15 min.)	
		ADD THESE AMOUNTS					
Grams	Oz.	Grams	Drops**	Grams	Drops**	Grams	Drops**
20	..	.02	1	0.10	5	0.20	9
57	2	.06	3	0.29	14	0.57	24
100	..	.10	5	0.50	25	1.00	43
113	4	.11	6	0.57	30	1.13	49
200	..	.20	10	1.00	50	2.00	85
227	8	.23	12	1.14	60	2.27	97
454	16	.45	23	2.27	118	4.54	194
Grams	Lbs.						
2268	5	2.3	..	11.3	..	22.9	..
4536	10	4.5	..	22.7	..	45.4	..

NOTE: Amount of curing agent shown in this table is intended only to be used as a guide. Other amounts may be suitable, depending upon type and concentration used.

*Thermolite — Reg. Trade Mark, M & T Chemical Corp.

Nuocure — Trade Mark, Nuodex Products Co.

**Measured from conventional-type medicine dropper.



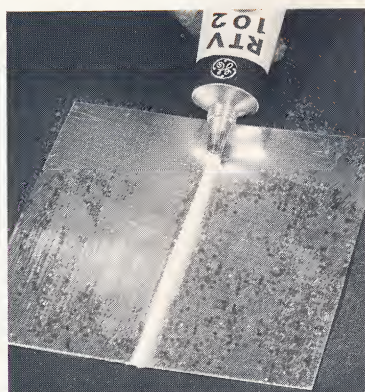
RTV

SILICONE

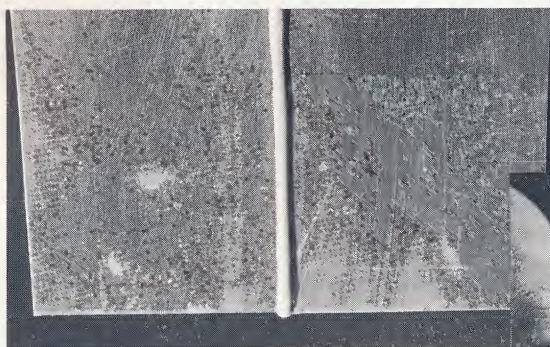
RUBBER

is easy to use!

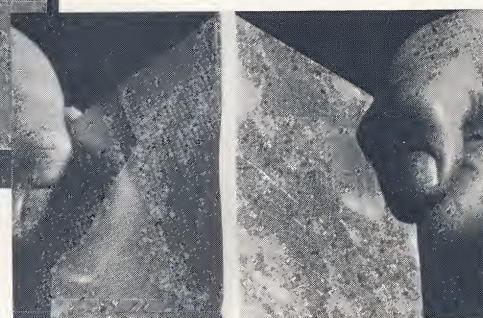
READY-TO-USE RTV ADHESIVE/SEALANT



1 Apply directly from tube — no catalyst or primer needed.



2 Cures at room temperature on exposure to normal moisture in air.



3 Cures to durable, flexible silicone rubber. Forms excellent bonds.

APPLYING RTV BY SPRAY

RTV compounds, after being diluted with mineral spirits or equivalent solvent, may be sprayed in commercial spray equipment. They can be catalyzed before spraying, or the catalyst may be oversprayed as a second coat.

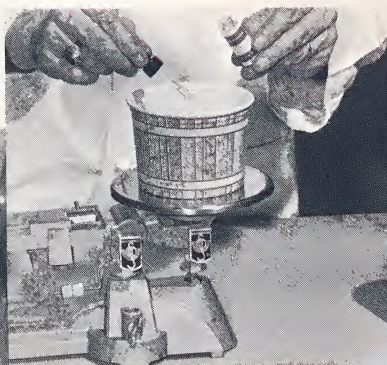
RTV-60 silicone rubber and curing agent are available in aerosol packages for convenient application.



TWO-PACKAGE RTV COMPOUNDS



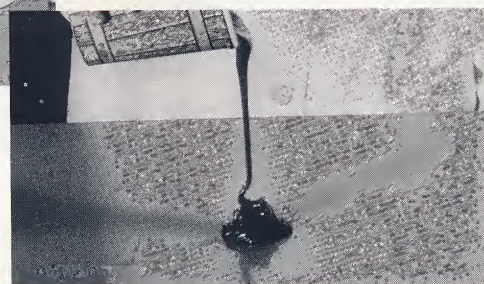
1 Measure sufficient RTV for your application.



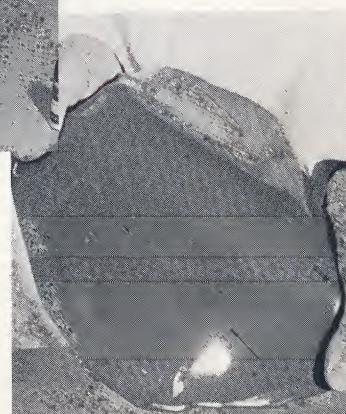
2 Add curing agent. Quantity and type will determine cure rate.



3 Mix thoroughly. Keep air entrapment and bubbles to a minimum.

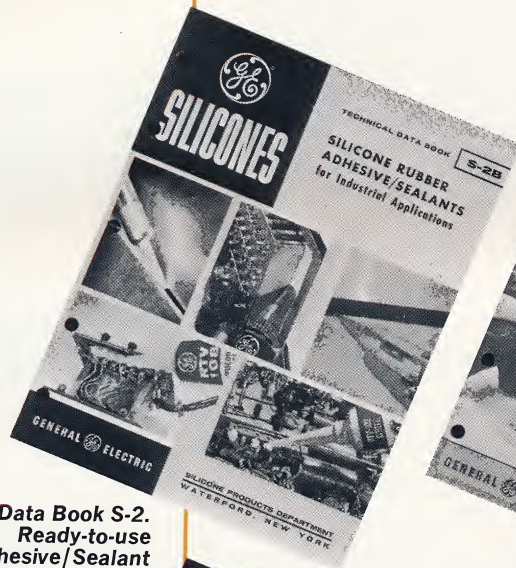


4 Apply by any convenient method — pouring, dipping, brushing.



5 Allow to cure at room temperature — forms durable, resilient rubber.

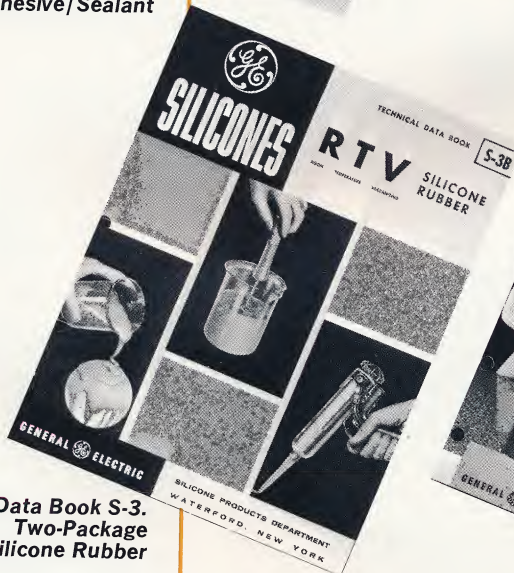
For more information, write for these Bulletins or contact your nearest General Electric silicone sales office



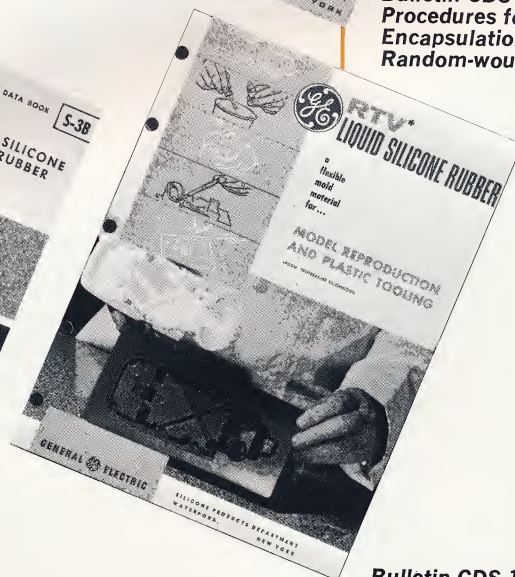
Technical Data Book S-2.
Ready-to-use
Adhesive/Sealant



Bulletin CDS-254.
Procedures for RTV
Encapsulation of
Random-wound Motors



Technical Data Book S-3.
Two-Package
RTV Silicone Rubber



Bulletin CDS-191.
RTV Flexible Molds

SILICONE PRODUCTS DEPARTMENT
GENERAL  ELECTRIC

WATERFORD, NEW YORK



HERE IS THE INFORMATION
YOU REQUESTED ON
SILICONES

GENERAL  ELECTRIC

SILICONE PRODUCTS DEPARTMENT, WATERFORD, N. Y.

GENERAL ELECTRIC SILICONES

BRING YOU ADDED VALUE THROUGH . . .

TECHNICAL SERVICE

In every field of silicone technology, General Electric specialists are available to aid customers in solving their technical problems. Working with the most modern testing equipment, these specialists are continually furnishing customers with up-to-date technical information about General Electric silicone products.



CUSTOMER SERVICE

The large inventory of silicone products kept in stock is only one of the ways in which General Electric assures rapid delivery of customer orders. Regional warehouses, a nation-wide teletype communications network, rapid shipping and close control of production schedules also help to speed delivery to customers.

PRODUCT QUALITY

General Electric assures the high quality of its silicone products by careful control of manufacturing operations. As a final quality control check, all products are analyzed and tested before they are released.

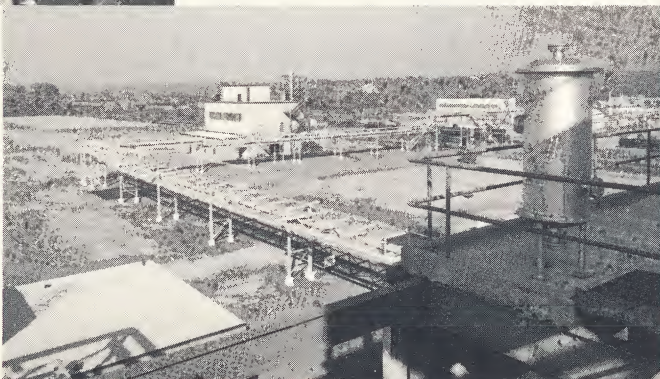


RESEARCH

In one of the world's largest silicone research facilities, General Electric scientists are working to develop new and improved silicone products. Through the years, G.E. has led in silicone research with such achievements as the first basic patents in the fields of silicone fluid, resin and rubber.

MODERN FACILITIES

New manufacturing facilities at the General Electric silicone plant in Waterford, New York broaden the range of new products and make possible higher quality products through faster manufacturing cycles, factors which result in better values for the customer.



SILICONE SALES OFFICES

CALIFORNIA, Downey 90240

8555 East Florence Ave.
213-773-3144 • 213-773-3277

CALIFORNIA, San Francisco 94119

1201 Bryant St.
415-863-4000 ext. 305

CONNECTICUT, Bridgeport 06602

1285 Boston Avenue
203-334-1012

D. C., Washington 20005

777 14th St. N. W.
202-393-3600

FLORIDA, Jacksonville 32207

1914 Beachway Rd.
305-359-5053

GEORGIA, Atlanta 30302

1860 Peachtree Rd., N.W.
404-876-2451

ILLINOIS, Chicago 60680

840 South Canal St.
312-663-3717

INDIANA, Indianapolis 46207

3750 N. Meridian St.
317-923-7221

MASSACHUSETTS, Boston 02135

145 North Beacon Street
617-254-5316

MICHIGAN, Oak Park 42837

21590 Greenfield Road
313-548-6005

MINNESOTA, (Minneapolis) St. Paul

55104
540 North Fairview Ave.
612-645-2765

MISSOURI, St. Louis 63132

1530 Fairview Ave.
314-429-6930

NEW JERSEY, Newark 07108

254 Elizabeth Avenue
201-243-3662

NEW YORK, Waterford 12188

518-237-3330, Ext. 202, 203

NEW YORK, Schenectady 12305

518-374-2211, Ext. 5-4645

NEW YORK, New York 10022

570 Lexington Ave.
212-751-1311, Ext. 3465

NEW YORK, Buffalo 14211

1495 Fillmore Ave.
716-892-8000, Ext. 255

NORTH CAROLINA, Greensboro

27408
1844 Pembroke Road
919-273-2835

OHIO, Cleveland 44109

1503 Brookpark Road
216-749-2700

OHIO, Dayton 45402

118 West First St.
513-223-7151

PENNSYLVANIA, Drexel Hill 19026

5050 State Road
215-259-2131

PENNSYLVANIA, West Mifflin 15122

4930 Buttermilk Hollow Road, R.D. #1
412-466-6700

TEXAS, Dallas 75235

6500 Cedar Springs
214-351-3725

TEXAS, Houston 77006

3100 Richmond Ave.
713-529-3128

WASHINGTON, Seattle 98111

710 Second Ave.
206-624-8300

IN CANADA

Canadian General Electric Co., Ltd.
940 Lansdowne Avenue, Toronto
416-534-6511

FOR EXPORT

International General Electric Co.
New York 16, 159 Madison Ave.
212-751-1311

NEED MORE INFORMATION?

**SPECIFIC APPLICATION
PROBLEM?** Please describe
your application as com-
pletely as possible

I WOULD LIKE SUGGESTIONS FOR USING SILICONES IN THE FOLLOWING APPLICATION:

Description, requirements, operating conditions, etc. _____

Is this a proposed or existing application? Is another material being used? If so,
why is it unsatisfactory? _____

Any other information you can give or that you desire _____

**JUST DETACH REPLY
CARD, FOLD IN HALF
ALONG THIS LINE, STA-
PLE CLOSED AND MAIL.**
No envelope or postage is
necessary

PLEASE SEND INFORMATION ABOUT THE FOLLOWING G-E SILICONE PRODUCTS:

- ☐ Silicone Rubber
- ☐ RTV Liquid Silicone Rubber
- ☐ RTV Silicone Rubber Adhesive/Sealants

Electrical Insulation

- ☐ Potting & Encapsulating Materials
- ☐ Silicone Insulation for Wire & Cable
- ☐ Dielectric Fluids & Greases
- ☐ Insulating Varnishes

- ☐ Silicone Construction Sealant

- ☐ Silicone Fluids

- ☐ Silicone Lubricants

- ☐ Silicone Greases

- ☐ Silicone Masonry Water Repellents

- ☐ Silicone Mold Release Agents

- ☐ Silicone Antifoams

- ☐ Silicones for High Temperature Paints

- ☐ Organosilicon Chemicals

APPLICATION

**INTERESTED IN OTHER
GENERAL ELECTRIC SILI-
CONE PRODUCTS?** Please
check proper product cate-
gory and state proposed
application

NAME _____ **TITLE** _____

COMPANY _____

STREET _____

CITY _____ **STATE** _____

ZIP CODE _____

BUSINESS REPLY MAIL

No Postage Stamp Necessary if Mailed in the United States

FIRST CLASS
PERMIT No. 18
WATERFORD, N. Y.

POSTAGE WILL BE PAID BY

GENERAL ELECTRIC COMPANY
SILICONE PRODUCTS DEPARTMENT
WATERFORD, NEW YORK 12188



CARTRIDGE-PACKED RTV-108, 103 and 102

*outstanding for ease of application,
rapid cure, and bondability*

New cartridge-packed RTV in translucent, white and black can be used in an unlimited number of applications, ranging from electrical, electronic, aerospace and general industrial sealing to maintenance and on-the-spot-repairs. It's easy to apply, cures rapidly without addition of a curing agent and provides an excellent bond to glass, aluminum, steel, ceramics, many plastics and other materials. No other adhesive/sealant can match RTV for extreme temperature performance, durability, flexibility and ease of application.

TYPICAL CURED PROPERTIES

RTV-108 (Translucent), RTV-102 (White), RTV-103 (Black)

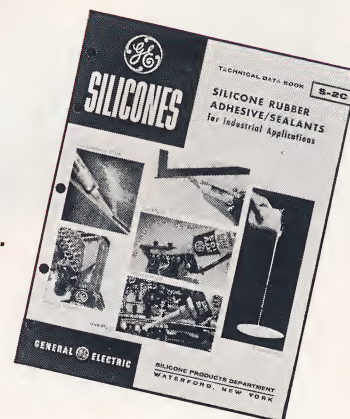
Specific Gravity	1.07
Hardness, Shore A Durometer	30
Tensile Strength, psi	350
Elongation, %	400
Tear Resistance, die B, lb/in	45
Brittle Point, °F	Below —90°F
Linear Shrinkage, %	1.0
Thermal Conductivity BTU-ft/hr ft ² °F @ 200°F	0.12
Dielectric Strength, volts/mil 0.075" thick	500
Dielectric Constant @ 60 cps	2.8
Dissipation factor @ cps	.0026
Volume Resistivity, OHM-cm	3x10 ¹⁵

FOR COMPLETE PROPERTY AND USE DATA,
WRITE FOR TECHNICAL DATA BOOK S-2.

SILICONE PRODUCTS DEPARTMENT

GENERAL  ELECTRIC

WATERFORD, NEW YORK



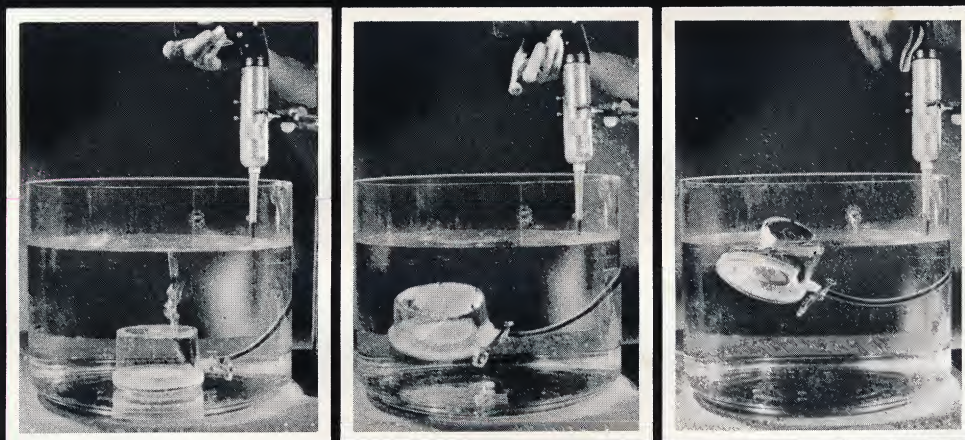


NEW **G-E RTV-7** FOAM

for mechanical support, shock
and vibration damping ... foams up
to 5 times original volume

New RTV-7 is a liquid silicone rubber which cures to a flexible foam with the addition of a curing agent and is a compound whose density can be changed by blending with standard liquid silicone rubber materials. RTV-7 can be foamed on the spot to provide mechanical support, shock vibration

damping and light-weight electrical insulation. RTV-7 remains flexible at extremely low temperatures and resists extremely high temperatures (-65°F to $+600^{\circ}\text{F}$) thus making it suitable for the most extreme environmental applications.



Cures in extreme environments, even in water

A small quantity of RTV-7 with curing agent is ejected from caulking cartridge through hose into water filled container. Material begins to cure instantly pushing water out and causing the container to rise. Above

test shows ability of RTV-7 to foam on site in the most extreme environments but still provide immediate protection from shock and vibration.

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WATERFORD, NEW YORK



CUSTOM BLEND. RTV-7 silicone rubber foam expands after the addition of a curing agent. RTV-7 with up to 20% concentration of the standard RTV silicone rubbers can be made into a variety of densities allowing for foams to be custom made as required for each specific application.



CURES IN TEN MINUTES FLAT. New RTV-7 foam is supplied as an uncatalyzed black base compound of 7000-9000 centistoke viscosity. Curing action and foaming does not begin until the addition of a curing agent. Within 10 minutes after a curing agent is added, however, foaming and curing are both complete. Thus mechanical support and protection is almost instantaneous.

RTV-7 Silicone Rubber Foam ... outstanding for mechanical support ... and for shock-vibration damping

New RTV-7 silicone rubber foam can be used in an unlimited number of applications where component support and protection from shocks and vibration is required. RTV-7 can be used as light-weight electrical

insulation and low-density thermal protection. No other material can match the instant protection and custom made features of General Electric's new RTV-7.

Typical cured properties

Typical Properties of RTV-7 Foam

(These values are not for use in preparing product specifications)

Cured RTV Foam

(100 parts of RTV-7 Foam mixed with five parts of catalyst. Samples cured 24 hours at 77°F and 50 percent RH.)

Density

Free Blown = 12.5 lbs/ft³
0.125 Inch Molded Slab = 16.7 lbs/ft³

*Tensile Strength = 20 psi

*Elongation = 70%

**Measured on ASTM dumbbells cut from an 0.080 inch thick molded slab*

Blending

RTV-7 Foam is compatible with most General Electric RTV products. Variations in properties to fit a specific need may be obtained by adding up to 20 weight percent of another RTV silicone rubber compound to RTV-7 before catalyzation.

FOR MORE INFORMATION, REFER TO DATA BOOK S-3